



STREAM FLOW DATA for COLORADO

Compiled by
the Hydrographic
Branch

Edited by
Thomas Ley

Water Year 2010

COLORADO



DEPARTMENT OF
NATURAL
RESOURCES

Executive Director Jim Martin
Department of Natural Resources



Governor Bill Ritter
State of Colorado



Director/State Engineer Dick Wolfe
Division of Water Resources

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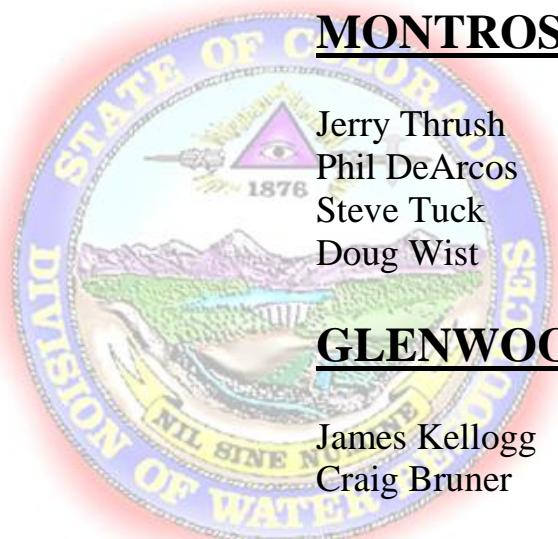
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PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
Water Year 2010

Location.--	Lat. 38°56'53", Long. 105°41'02", in the SW ¼ of the NE ¼ Sec.21, T125, R76W, Park County, Hydrologic Unit 10190001, on left bank about 400 ft below the Reservoir.
Drainage and Period of Record.--	Drainage area approximately 185 square miles; flows regulated by Antero Reservoir outlet works. 1976 to current year.
Equipment.--	Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 satellite Data Collection Platform (DCP) with an independent standalone Sutron Stage Discharge Recorder (SDR) in a concrete shelter over a 48 inch concrete well at a sharp crested Cipolletti weir with broad-crested concrete overflow walls. The well is connected to channel by two 4-inch intakes located at the same elevation. An electric tape gage (ETG) on a equipment shelf is the primary reference. There are no supplemental gage provisions. The SDR was installed February 3, 2010 replacing the Stevens A-71 graphic water -stage. Gage is operated in cooperation of the Denver Water Department (DWD) and the Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	Drainage area approximately 185 square miles; flows regulated by Antero Reservoir outlet works.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart record and hourly averages of 5 minute SDR as back up. Regular visits ensure that the blade of the Cipolletti weir remained clean. No corrections were necessary after cleaning. Frequent visits by DWD and CDWR staff ensured good instrument calibration. The record is complete and reliable. The large intakes (4 inch) create gage height (GH) fluctuation at higher flows. Base reference and instrument calibration checks can be somewhat dubious at stages above 1.50 feet.
Datum Corrections.--	Levels were run to the ETG on October 2, 2009 using R.M. 2 as base. The gage was found to be reading accurately.
Rating.--	The control is a 10 ft. sharp-crested stainless steel Cipolletti weir centered in a rectangular concrete wall within a concrete trapezoidal canal section. Flows can exceed the confines of the Cipolletti weir at which point the control becomes compound with the concrete walls functioning as a broad crested weir. Initially the weir employed a theoretic rating based on compound weirs. However, this proved inaccurate and a new rating, MOD10FTCIP was developed using the Cipolletti rating to a stage of 3.16 ft and discharge of 192 cfs. Above 3.16 ft. the rating is defined to 316 cfs by measurements made in 2002 and 2003. This rating was utilized for 2010. By agreement with DWD, CDWR will not use shifts on the Cipolletti portion of the rating. The accuracy of the Cipolletti portion of the weir is thought (by Denver) to be somewhat better than the accuracy of the Price meter made in a natural channel. No discharge measurements were made this year. However, once above GH's of about 3.16, the rating is based on a few measurements with only Fair accuracy due to surging GH conditions. Currently there is no suitable location to measure higher flows. The measurement bridge over the stilling pool is not usable due to eddies and extreme turbulence in the pool during high releases. The peak discharge of 234 cfs occurred at 0910 on June 14, 2010 at a gage height of 3.40 ft. with a shift of 0.00 ft.
Discharge.--	Shifts could be caused by moss growth and approach velocities. By agreement with the DWD, the rating was applied directly to gage heights. Flow is controlled by low head slide gates which are prone to blockage by debris, causing spikes in flow until the material breaks free or is flushed out by caretaker opening the gate. The peak flow was outside the Cipolletti portion of the structure and flow conditions were not observed. For flows above the Cipolletti, some combinations of gate operation and outlet size choice can yield flow conditions which are too violent to be defined by a rating.
Special Computations.--	Peak flow occurred as the larger conduit was placed into service while release was increased. The peak event duration was less than fifteen minutes. Stage data for the peak was taken from SDR which records at five minute intervals providing increased event resolution.
Remarks.--	The record is good with the exception of the instantaneous peak discharge which is poor. The peak stage of 3.40 feet was outside the upper limit of the Cipolletti weir where the rating is not well defined. Also, the peak flow conditions were not observed, and the amount of stilling in the weir pool can be quite variable depending on outlet operations. Station maintained and record developed by Mike Wild.
Recommendations.--	Due to limitations and or issues associated with performing conventional current meter measurements at this site, investigation and evaluation of the weir's rating by use of an Acoustic Doppler Current Profiler (ADCP) should be considered. However, site condition suitability for ADCP use has not been evaluated as of yet, and excessive air entrainment introduced by the baffle structure located in the weir pool may preclude ADCP use.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR

RATING TABLE--

MOD10FTCIP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

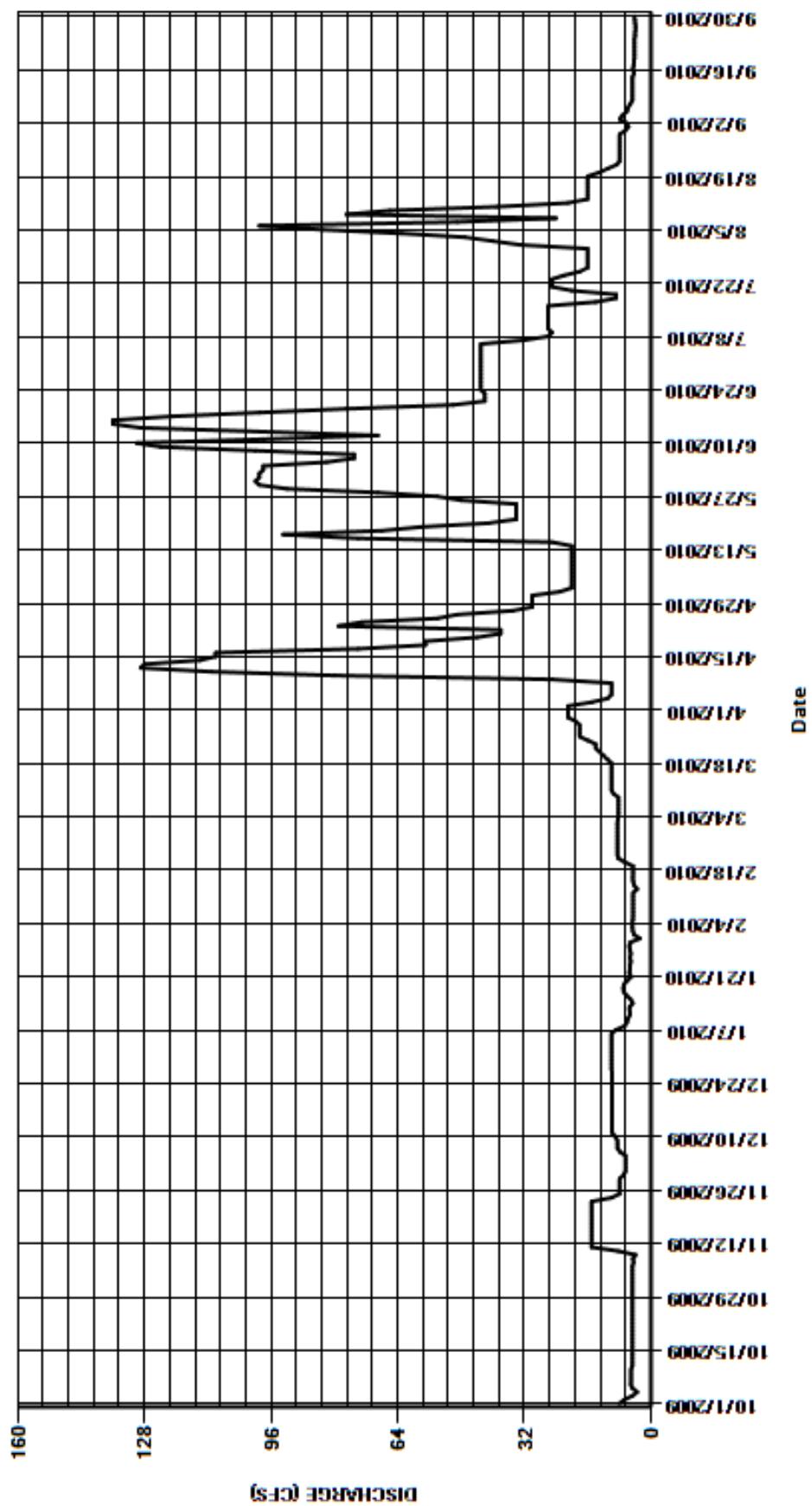
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8	4.7	6.4	10	4.3	8.5	21	30	99	43	33	5.7
2	6.7	4.7	6.4	10	4.6	8.5	21	23	99	43	40	6.2
3	4.7	4.7	6.4	10	4.7	8.4	15	20	98	43	47	7.9
4	3.5	4.7	6.4	10	4.7	8.3	11	20	98	43	63	7.2
5	4.7	4.7	6.4	10	4.6	8.2	10	20	82	43	83	6.1
6	5.1	4.7	7.8	10	4.5	8.2	10	20	75	43	99	5.8
7	5	4.4	8.5	8.9	4.5	8.2	10	20	75	32	49	5.2
8	5	4.6	8.5	6.7	4.5	8.2	10	20	100	26	24	4.7
9	5	3.9	8.5	6.1	4.5	8.2	25	20	124	25	77	4.7
10	5	8.3	9	5.8	4.5	9.5	80	20	130	26	66	4.7
11	4.7	15	9.8	5.3	4.5	10	111	20	98	26	39	4.7
12	4.7	15	9.8	5.4	4.5	10	129	20	69	26	21	4.7
13	4.7	15	9.8	5.4	3.5	10	128	20	99	26	16	4.7
14	4.7	15	9.8	4.6	4.3	10	114	20	129	26	16	4.7
15	4.7	15	9.8	5.1	4.5	10	110	25	136	26	16	4.3
16	4.7	15	9.8	6.1	4.6	10	110	74	136	26	16	4.6
17	4.7	15	9.8	6.9	4.5	10	74	93	121	14	16	4.4
18	4.7	15	9.8	7	4.5	10	57	68	99	8.8	16	4.3
19	4.7	15	9.8	6.8	4.5	11	57	58	77	8.8	16	4.2
20	4.7	15	9.8	6	6.6	12	44	41	50	20	13	4.2
21	4.7	15	9.8	5	8.2	13	38	34	42	25	11	4.2
22	4.7	15	9.8	5.5	8.5	14	38	34	42	25	8.7	4.2
23	4.7	15	9.8	5.3	8.5	14	79	34	42	25	7.9	4.2
24	4.7	9.9	9.8	5.3	8.5	16	73	34	43	22	7.9	4.2
25	4.7	7.9	9.8	5.1	8.5	18	54	34	43	18	7.9	4
26	4.7	7.9	9.8	5.3	8.5	18	49	48	43	16	7.9	4
27	4.7	7.9	9.9	5.1	8.5	18	35	54	43	16	7.9	3.9
28	4.7	7.9	10	5.3	8.5	18	30	69	43	16	7.9	4
29	4.7	7.9	10	5.5	---	19	30	92	43	16	7.9	4.1
30	4.7	6.9	10	5.2	---	21	30	99	43	16	7.9	4.2
31	4.7	---	10	2.8	---	21	---	100	---	16	6.5	---
TOTAL	151.4	300.7	281.0	201.5	159.1	377.2	1603	1284	2421	785.6	855.4	144.0
MEAN	4.88	10	9.06	6.5	5.68	12.2	53.4	41.4	80.7	25.3	27.6	4.8
AC-FT	300	596	557	400	316	748	3180	2550	4800	1560	1700	286
MAX	8	15	10	10	8.5	21	129	100	136	43	99	7.9
MIN	3.5	3.9	6.4	2.8	3.5	8.2	10	20	42	8.8	6.5	3.9
CAL YR	2009	TOTAL	7402.4	MEAN	20.3	MAX	174	MIN	3.5	AC-FT	14680	
WTR YR	2010	TOTAL	8563.9	MEAN	23.5	MAX	136	MIN	2.8	AC-FT	16990	

MAX DISCH: 234 CFS AT 09:10 ON Jun. 14,2010 GH 3.4 FT. SHIFT 0 FT.

MAX GH: 3.4 FT. AT 09:10 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
Water Year 2010

Location.--	Lat. 38°59'10", Long. 105°40'52" in NE1/4 Sec 21, T. 12S, R. 74W, Park County, 3.3 miles below the confluence of the Middle and South Forks of the South Platte River, and 7 miles southeast of Hartsel, CO.
Drainage and Period of Record.--	772 square miles. October 1982 to present.
Equipment.--	Graphic water-stage recorder and Sutron SatLink 2 Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) in a wooden shelter over a concrete well at a 25-foot concrete Parshall flume. The primary reference is an inside Electric Tape Gage (ETG) with a staff gage on the right side at the Ha location. The gage and satellite monitoring equipment are owned and maintained by the City of Aurora. Aurora operates the gage seasonally and it is shut down in the winter. Colorado Division of Water Resources (DWR) operates the gage under a contract with City of Aurora to provide real time data and for record development. A Sutron Stage-discharge recorder (SDR) was installed July 8, 2010 and the graphic water-stage recorder was removed.
Hydrologic Conditions.--	Flow at gage affected by releases from Antero Reservoir and natural flows from the South and Middle Fork of the South Platte River and Four Mile creek. Releases from Montgomery Reservoir and irrigation diversions also affect flows.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart and SDR back up. The record is complete and reliable, except as follows: November 10, 2009 to April 12, 2010 - DCP and gage were shut down for winter; October 29 to November 2, 2009 - Stage discharge relationship was affected by ice. On two days (June 9, 2010 - 09:00, July 16, 2010 - 09:00) hourly values were compromised by flushing of the intakes. Onsite observations along with good chart data were used to fill in missing data without loss of accuracy. . On July 31, 2010 an apparent lightning strike near the gage reset the SE to zero at 16:30 hours. The SE was reset to the ETG on August 1, 2010 at 10:45. The primary record agrees with the chart to within 0.02 ft. Good chart data was used to fill in the missing data without loss of accuracy. Thirty visits were made to the gage, one shaft encoder adjustment of -0.01 ft was necessary on September 13, 2010.
Datum Corrections.--	Levels were last run on August 27, 2008. No corrections were made.
Rating.--	The control is a 25-foot Parshall flume with a standard rating. Negative shifting can be caused by moss growth; however this year significant moss growth was not observed. Positive shifting is possibly caused by the approach conditions. An effort was made at spring start up to excavate the weir pool, but it filled early in the year. Shifting was not significantly affected. Observations from levels reveal that the crest is slightly lower than the converging section which could cause reduced gage height and positive shifting. High flows have been observed to by-pass the flume by leaving the channel and crossing the access road. This is believed to occur at gage heights greater than 4.00 ft. and at flows in the 1000 cfs range. The rating is well defined to 493 cfs by measurements made since 2001. Wading measurements are made downstream of the foot bridge (measurement section width 30.5 ft.) while section rod and cable measurements are made on upstream side (measurement section width 32.1 ft.). Bridge is indexed on both sides to obtain accurate section widths. Fourteen measurements (Nos. 289 - 302) were made during the water year ranging in discharge from 21.6 to 493 cfs. The average daily flow was above the highest measurement on the following days: June 8-10, 2010. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 25 ft Parshall Flume is 15 to 1200 cfs. Anything above or below this range is outside the +/- 5% accuracy range. All flows during the 2010 water year were within this range during the operational period of the gage. The peak flow of 546 cfs occurred at 0800 on June 10, 2010 at a gage height of 2.91 ft. with a shift of 0.08 ft. It exceeded measurement No. 295 made June 8, 2010 by 0.19 ft. in stage.
Discharge.--	Shifting control method was used all year. Stage dependent shifting was used for the majority of the year with the exception of periods where moss accumulation could be identified and shifts were applied as defined by measurements and were distributed mainly by time with consideration to change in stage. Two variable shift tables, PLASPICOVST1 and PLASPICOVST2, based on measurements made during the water year, were utilized for the record with the exception of winter estimated periods. The range in stage experienced this year was confined to the weir section. Measurements for the entire water year show shifts varying from -0.02 ft. to 0.08 ft. Shifts were distributed as follows: October 1, 2009 to April 22, 2010: PLASPICOVST2 from water year 2009 was used with the addition of measurements 289-291 made during the period. Measurement 290 was adjusted 2% to fit the table. April 22 to May 25, 2010: Measurements 291-293 given full weight and applied by time. The pool in front of the gage was being excavated during this period. The measured shifts covered most of the range in stage, so little accuracy was lost by not considering stage change. May 25, 2010 to July 28, 2010: Variable shift table PLASPICOVST1 developed from measurements Nos. 293 through 298 made during the period, was used. Msmt No. 294 was adjusted 1% and No. 297 by 1% to better fit the stage shift curve. July 28, to September 30, 2010: Variable shift table PLASPICOVST2 developed from Mmts No. 299-302 made during the period and given full weight was applied. September 30, 2010 (12:22 to 23:45): Time distribution. Measurement given full weight.
Special Computations.--	Discharge for estimated days October 29-November 2 and April 12 was based on partial and adjacent record. Gage closure periods were estimated as below except for April 8-11 which was based on temperature trends as the stream opened up. The winter estimates (gage closed) were taken from Aurora's Spinney Mountain Reservoir accounting; the figures are based on reservoir elevation readings, and tend to show step-wise changes. The frequency of the reservoir elevations readings is daily; however surface ice on the reservoir affects the readings, so the accuracy of daily discharges is questionable.

Remarks.--

The record is good, except for the periods of ice effect and no gage height record, which are estimated and fair to poor.
Station maintained and record developed by Mike Wild .

Recommendations.--

None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR

RATING TABLE--

STD25FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

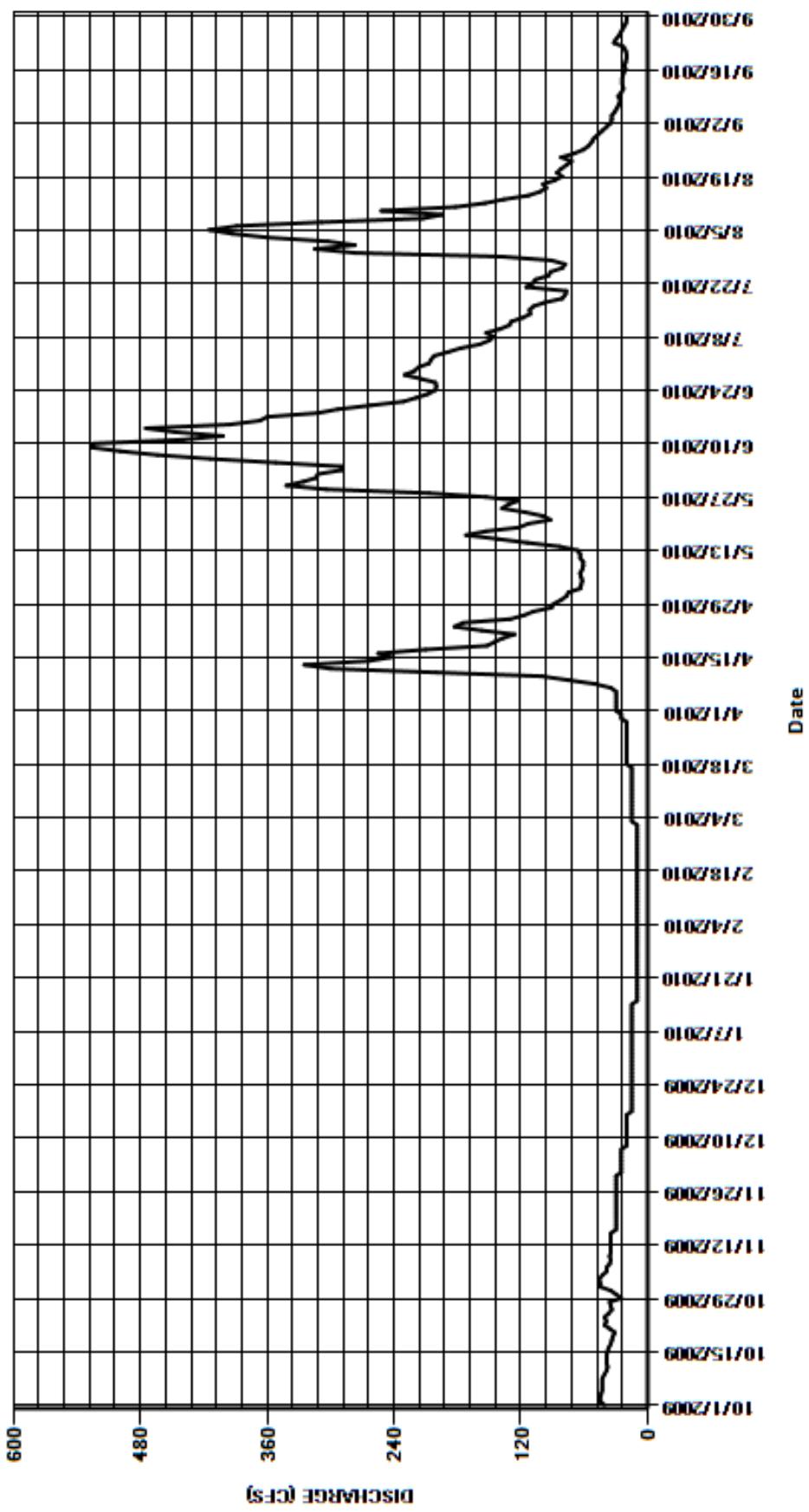
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	45	25	15	10	10	30	77	314	207	277	39
2	45	45	25	15	10	10	30	75	312	205	303	35
3	45	46	25	15	10	15	30	64	290	202	360	34
4	44	43	25	15	10	15	30	63	290	189	393	34
5	43	39	25	15	10	15	30	62	352	177	415	31
6	43	39	25	15	10	15	30	63	414	159	389	29
7	43	36	25	15	10	15	35	64	464	150	309	27
8	43	35	20	15	10	15	50	62	499	146	213	26
9	41	36	20	15	10	15	75	61	527	153	194	28
10	39	35	20	15	10	15	100	61	524	140	252	25
11	38	35	20	15	10	15	200	64	440	131	182	23
12	39	35	20	15	10	15	300	64	402	129	154	24
13	39	35	20	15	10	15	325	66	447	118	136	24
14	39	35	20	15	10	15	264	83	475	111	113	24
15	38	35	20	10	10	15	243	114	395	112	102	23
16	37	30	20	10	10	15	255	142	367	108	96	21
17	35	30	15	10	10	15	210	172	360	97	99	22
18	34	30	15	10	10	20	152	153	312	81	88	21
19	33	30	15	10	10	20	145	122	293	78	81	20
20	31	30	15	10	10	20	137	113	262	77	86	20
21	36	30	15	10	10	20	126	92	231	115	82	21
22	41	30	15	10	10	20	157	99	219	109	77	23
23	39	30	15	10	10	20	183	116	208	106	72	32
24	41	30	15	10	10	20	175	138	201	94	82	30
25	37	30	15	10	10	20	130	132	200	92	70	27
26	34	30	15	10	10	20	117	123	201	81	61	25
27	35	30	15	10	10	20	108	153	215	78	56	23
28	36	30	15	10	10	20	91	207	230	91	53	21
29	25	30	15	10	---	20	89	304	221	138	51	20
30	30	30	15	10	---	25	82	342	217	278	47	20
31	35	---	15	10	---	25	---	326	---	315	43	---
TOTAL	1179	1024	580	380	280	535	3929	3777	9882	4267	4936	772
MEAN	38	34.1	18.7	12.3	10	17.3	131	122	329	138	159	25.7
AC-FT	2340	2030	1150	754	555	1060	7790	7490	19600	8460	9790	1530
MAX	45	46	25	15	10	25	325	342	527	315	415	39
MIN	25	30	15	10	---	25	---	326	---	315	43	20
CAL YR	2009	TOTAL	31135	MEAN	85.3	MAX	475	MIN	15	AC-FT	61760	
WTR YR	2010	TOTAL	31541	MEAN	86.4	MAX	527	MIN	10	AC-FT	62560	

MAX DISCH: 546 CFS AT 08:00 ON Jun. 10,2010 GH 2.91 FT. SHIFT 0.08 FT.

MAX GH: 2.91 FT. AT 08:00 ON Jun. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
Water Year 2010

Location.--	Lat. 38°58'03", Long. 105°34'51", in NE 1/4 sec. 32, T.12 S., R.73 W., Park County, Hydrologic Unit 10190001, on left bank 200 ft downstream from highway bridge, 2.5 mi upstream from water line of Elevenmile Canyon Reservoir, at elevation 8,561 ft. and 13 mi southeast of Hartsel.
Drainage and Period of Record.--	880 mi ² ; 1933 to present.
Equipment.--	Graphic water-stage recorder and Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) in a wooden shelter over a concrete well at a 25-foot concrete Parshall flume. Primary reference gage is inside electric tape gage with supplemental staff gage on the right side at the Ha location. A Sutron Stage-discharge recorder (SDR) was installed August 11, 2010 and the graphic water-stage recorder was removed. Facilities are owned and maintained by the Denver Water Board. Adjacent land owned by City of Aurora. Satellite instrumentation is owned and maintained by the State Engineers Office.
Hydrologic Conditions.--	The gage is approximately two miles below Spinney Mountain Reservoir, flow is controlled by reservoir releases. A small drainage empties in above the gage that is not controlled by the reservoir. This drainage can contribute significant flow after severe local rain events. The record is generally flat with step changes.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart and SDR back up. The primary record agrees with the chart and SDR data to within 0.02 ft. Generally releases above 80 cfs from Spinney Mountain Reservoir keep this gage open year round. Lower flows can see ice affect at the flume in two ways: ice jams upstream can cause a drop in flow followed by a surge. This can result in an accumulation of ice above the normal water line for that release period, as each brief surge hits the frozen flume walls. In this situation, the baseline GH's will be lower than the ice layers and be good record, but the higher surge GH's will be ice-affected. Ice jams downstream can cause backwater into the flume which can result in ice forming on the crest and walls of the flume. In either case, the GH record will not be the flat release expected and the computed flows will be higher than either Spinney release data or computed good record for that Spinney release period. Ice affects seen on days when a change is made in Spinney release are more complicated as there is a delay between gate changes at Spinney Reservoir and the gage, return flows are also seen following gate change reductions. The record is complete and reliable except for the following periods when the stage discharge relationship was affected by ice: November 24, 25, 27, 28, December 3, 4, 18, 26, 2009, January 9, February 10, 15, 2010. Moss was cleaned from the flume on July 13, 2010 causing a reduction in gage height following cleaning. Measurements were taken before and following the moss removal (867, 868) and were utilized to account for the cleaning correction. A tracked excavator was used to clean the weir pool approach to the flume on April 2, 2010. The work did not affect the GH record. Instrument calibration was verified by thirty visits made to the gage. Three SE adjustments of 0.01 ft each were made.
Datum Corrections.--	Levels were last run on August 27, 2008. No instrument corrections were made.
Rating.--	The control is a 25 ft. concrete Parshall flume. A standard rating has been used since the flume was installed in 1940. Rating No. 15, dated Oct. 1, 1970 is an expansion of the standard equation. Any flow by-passing the flume would be accounted for separately and not computed as part of this rating. The streambed is composed of compact cobble and gravel and silt, and a gravel bar often forms just upstream from the flume. The gravel bar will affect shifts and encourage more moss to form in the flume where the velocities have been slowed. Shifts are caused by gravel in the approach basin and moss. Sixteen measurements (Nos. 857 - 872) were made this year, ranging in discharge from 59.3 to 401 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 25 ft Parshall Flume is 15 to 1200 cfs. Anything above or below this range is outside the +/-5% accuracy range. All flows during the 2010 water year were within this range. The peak discharge of 458 cfs occurred at 1900 on August 6, 2010 at a gage height of 2.64 ft. with a shift of 0.04 ft. It exceeded measurement No. 865 by 0.22 ft. in stage and 57 cfs respectively.
Discharge.--	Shifting control method was used all year. Stage dependent shifting was used with the exception of periods where moss accumulation could be identified; for those periods shifts were applied as defined by measurements and were distributed mainly by time with consideration to change in stage. Measurements for the water year show shifts varying from -0.04 ft. to 0.04 ft. Shifts were distributed as follows: October 1, 2009 to May 25, 2010: shifts are caused by moss growth at low stages and by approach conditions at higher stages. Shifts were run by time with consideration to stage, holding the shift from No.861 (0.01 ft) to the stage change on April 14. Shift from Msmt No. 862 was started at peak flow event April 17. Shifts on April 15, 16, 2010 were hand prorated. Measurement No. 858 was adjusted in relation to adjacent shifts after review of GH fluctuation. May 25, 2010 to June 10, 2010: Stage-shift table PLAHCARCOVST1, developed from Msmts Nos. 863-865 made during the period and given full weight was applied. June 10, 2010 to June 25, 2010: Stage-shift table PLAHCARCOVST2, developed from Msmts Nos. 865-866 made during the period and given full weight was applied. June 25, 2010 to September 30, 2010: shifts were run by time to account for moss growth with consideration to stage. Measurement No. 871 was adjusted to account for heavy aquatic plant material in meter during measurement. Extremely high flows can bypass the gage through a culvert to the south. This did not occur this year.
Special Computations.--	Many ice days were estimated without significant loss of accuracy since these ice days fell in periods when the release by Spinney Reservoir remained constant. The remaining ice days were estimated from adjacent reliable record and from Aurora's Spinney Mountain Reservoir accounting.
Remarks.--	Record is rated good, except for periods of ice effect, which are considered fair. Station maintained and record developed by Mike Wild.

Recommendations.--

The existing rating maximum gage height is 6 ft. The flume walls and gage are to 8 ft. Consider rating table extension.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR

RATING TABLE-- STD25FTPf USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	69	72	63	78	79	84	78	87	104	321	150
2	108	69	82	62	79	79	73	79	97	116	341	149
3	109	68	82	61	78	79	68	78	116	127	369	149
4	109	68	82	63	77	79	67	78	144	153	372	149
5	109	68	81	63	77	79	69	78	115	161	382	149
6	109	68	80	61	77	79	68	77	113	149	427	148
7	109	68	82	63	77	79	65	73	152	136	419	148
8	98	68	79	62	77	79	70	62	251	114	370	148
9	89	69	81	62	56	79	81	62	346	67	321	148
10	89	68	82	63	35	79	83	62	400	51	271	148
11	89	69	79	70	35	79	82	63	399	52	252	148
12	81	68	80	78	35	78	80	62	367	67	251	149
13	74	69	80	77	35	79	76	62	347	90	245	149
14	74	69	80	77	35	79	103	64	349	99	216	149
15	74	69	81	77	35	79	203	89	349	113	190	142
16	74	69	81	77	46	79	280	118	333	152	181	135
17	74	68	71	77	50	79	325	124	293	188	173	134
18	74	69	62	77	50	73	281	77	294	188	166	134
19	69	68	62	77	50	64	237	59	296	190	164	134
20	65	68	62	77	50	63	237	59	297	191	165	118
21	65	68	62	77	50	64	211	59	298	193	166	106
22	71	68	62	77	50	64	187	59	273	192	163	106
23	79	67	62	77	49	64	216	59	225	191	161	96
24	79	68	61	78	65	64	241	59	173	191	160	84
25	79	68	60	77	79	64	220	60	151	192	160	84
26	79	68	62	78	79	64	202	60	123	175	156	84
27	79	68	62	77	79	64	179	60	102	152	151	84
28	73	68	62	77	79	64	134	60	103	143	151	83
29	69	68	63	77	---	64	94	61	104	143	151	83
30	68	68	62	78	---	64	78	61	104	167	151	85
31	68	---	61	77	---	77	---	76	---	271	151	---
TOTAL	2582	2048	2220	2237	1662	2259	4394	2178	6801	4518	7317	3773
MEAN	83.3	68.3	71.6	72.2	59.4	72.9	146	70.3	227	146	236	126
AC-FT	5120	4060	4400	4440	3300	4480	8720	4320	13490	8960	14510	7480
MAX	109	69	82	78	79	79	325	124	400	271	427	150
MIN	65	67	60	61	35	63	65	59	87	51	151	83

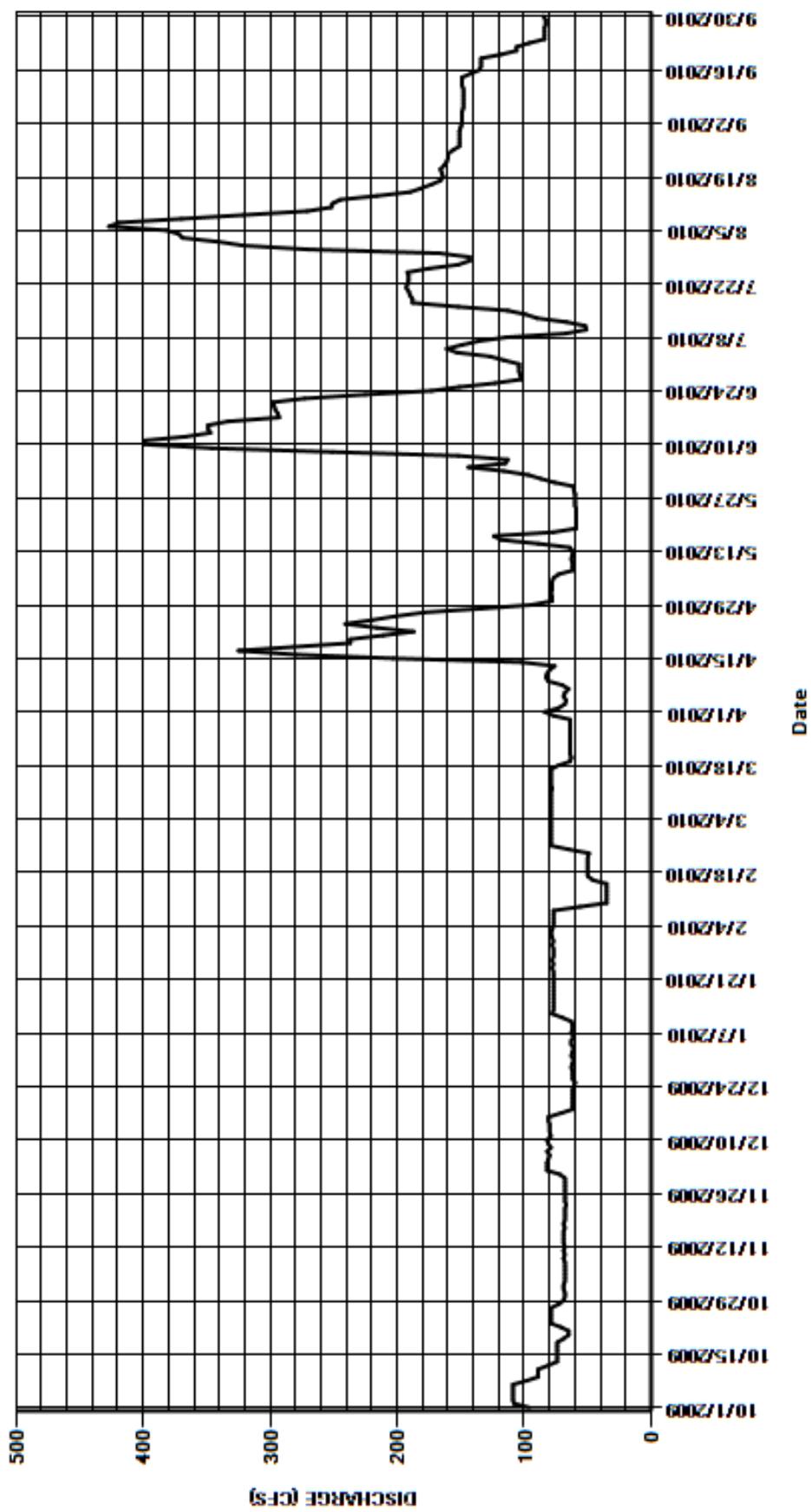
CAL YR	2009	TOTAL	45935	MEAN	126	MAX	461	MIN	35	AC-FT	91110
WTR YR	2010	TOTAL	41989	MEAN	115	MAX	427	MIN	35	AC-FT	83290

MAX DISCH: 458 CFS AT 19:00 ON Aug. 06,2010 GH 2.64 FT. SHIFT 0.04 FT.

MAX GH: 2.64 FT. AT 19:00 ON Aug. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

Water Year 2010

Location.--	Lat. 38°54'19", Long. 105°28'22". in SW¼ sec. 20, T.13 S., R.72 W., Park County, Hydrologic Unit 10190001, on left bank 700 ft downstream from Elevenmile Canyon Reservoir and 8.2 mi southwest of town of Lake George.
Drainage and Period of Record.--	963 mi ² . October 1929 to current year. Monthly data only for some periods.
Equipment.--	Graphic water-stage recorder and Sutron SatLink 2 satellite monitoring Data Collection Platform (DCP) with Sutron shaft encoder (SE) in a concrete shelter at a 15-foot concrete Parshall flume. Primary reference is an inside tape gage, and there is an enameled staff gage on the right side of the flume at the Ha location. The gage has power and the shelter is heated during cold weather. The gage is owned and maintained by the Denver Water Department. A 10-foot rectangular bypass channel is located beside the upper right wing wall of the 15-foot Parshall flume. The channel is normally kept closed by log stop (boards). At a gage height of 3.40 ft. in the Parshall flume, water reaches the floor of the bypass channel. A Sutron Stage-discharge recorder (SDR) was installed July 8, 2010.
Hydrologic Conditions.--	Natural flow of stream affected by storage variations in Eleven Mile Reservoir (capacity 97,780 acre feet), Spinney Mountain Reservoir releases (capacity 53,651 acre feet), and transmountain diversions from the Homestake pipeline into Spinney Reservoir, Antero Reservoir releases (capacity 22,300 acre feet) and diversions for irrigation and return flow from irrigated areas. Abrupt gage height fluctuations are experienced at this gage when the reservoir is spilling. Prevailing winds cause waves of water to wash over the spillway. The gage is close to the spillway channel and experiences the waves as rises and dips of unpredictable magnitude.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart and SDR back up. The primary record agrees with the chart to within 0.02 ft. The record is complete and reliable without missing values. Instrument calibration was verified by twenty visits made to the gage. One SE adjustment of +0.01 ft was made on May 25, 2010 and was prorated to the last visit.
Datum Corrections.--	Levels were run on August 8, 2010 using RM4 as a base. The RP was found to be 0.004 ft low (the gage was found to read 0.005 high) which is within the allowable limits of 0.02 ft., no correction to the RP was necessary.
Rating.--	The control is a standard 15-foot Parshall flume. Shifting is caused by moss and high approach velocities as weir pool is constricted by width and depth. Rating No. 4, dated October 1, 1971, is a standard Parshall flume table, the expanded version was used for the record. The by-pass was not used this year. A rating for the bypass was developed in 1995 and is included in the record. All flow in water year 2010 passed through the 15 foot Parshall flume. Sixteen measurements (Nos. 1088 - 1103) were made, ranging in discharge from 52.6 to 290 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 15 ft Parshall Flume is 8 to 600 cfs. Anything above or below this range is outside the +/- 5% accuracy range. The 15 ft rating for this flume has been further verified by measurements from 3.97 to 837 cfs. All flows during the 2010 water year were within this accuracy range. The peak discharge of 417 cfs occurred at 1630 on August 10, 2010 at a gage height of 3.41 ft. with a shift of +0.03 ft. It exceeded measurement No. 1099, made on June 18, by 0.69 ft. in stage.
Discharge.--	Shifting control method was used for the entire year. Measured shifts ranged from -0.03 to +0.03 feet. Shifts were applied as defined by measurements and were distributed mainly by time with some consideration to change in stage. Shifts were applied by as follows. October 1, 2009 to April 22, 2010: time distribution with all measurements given full weight. April 22 to May 5, 2010: time distribution with consideration to stage by applying measurement No. 1095 (May 5) back to peak flow event on April 24, 2010. Measurement 1095 was adjusted 3% to smooth distribution. May 5 to June 18, 2010: time distribution with consideration to stage by applying measurement No. 1099 (June 18) back to a peak flow event on June 15, 2010. Measurements 1095 and 1097 made during high wind were adjusted 3% and 1% to smooth time distribution. (Measurement 1097 was a check measurement.) Other measurements were given full weight. June 18 to August 17, 2010: time distribution with consideration to stage by applying measurement No. 1102 (August 17) back to a peak flow event on August 4, 2010. All measurements given full weight. August 17 to September 30, 2010: time distribution with all measurements given full weight. When clean, the flume will often show positive shifting, possibly due to approach velocities. Moss growth causes negative shifting.
Special Computations.--	None.
Remarks.--	The record is considered good. Station maintained and record developed by Mike Wild.
Recommendations.--	Approach conditions to the flume cause velocities greater than 0.5 ft/s in weir pool. Weir pool needs work to slow velocities.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

RATING TABLE--

STD15FTPf USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

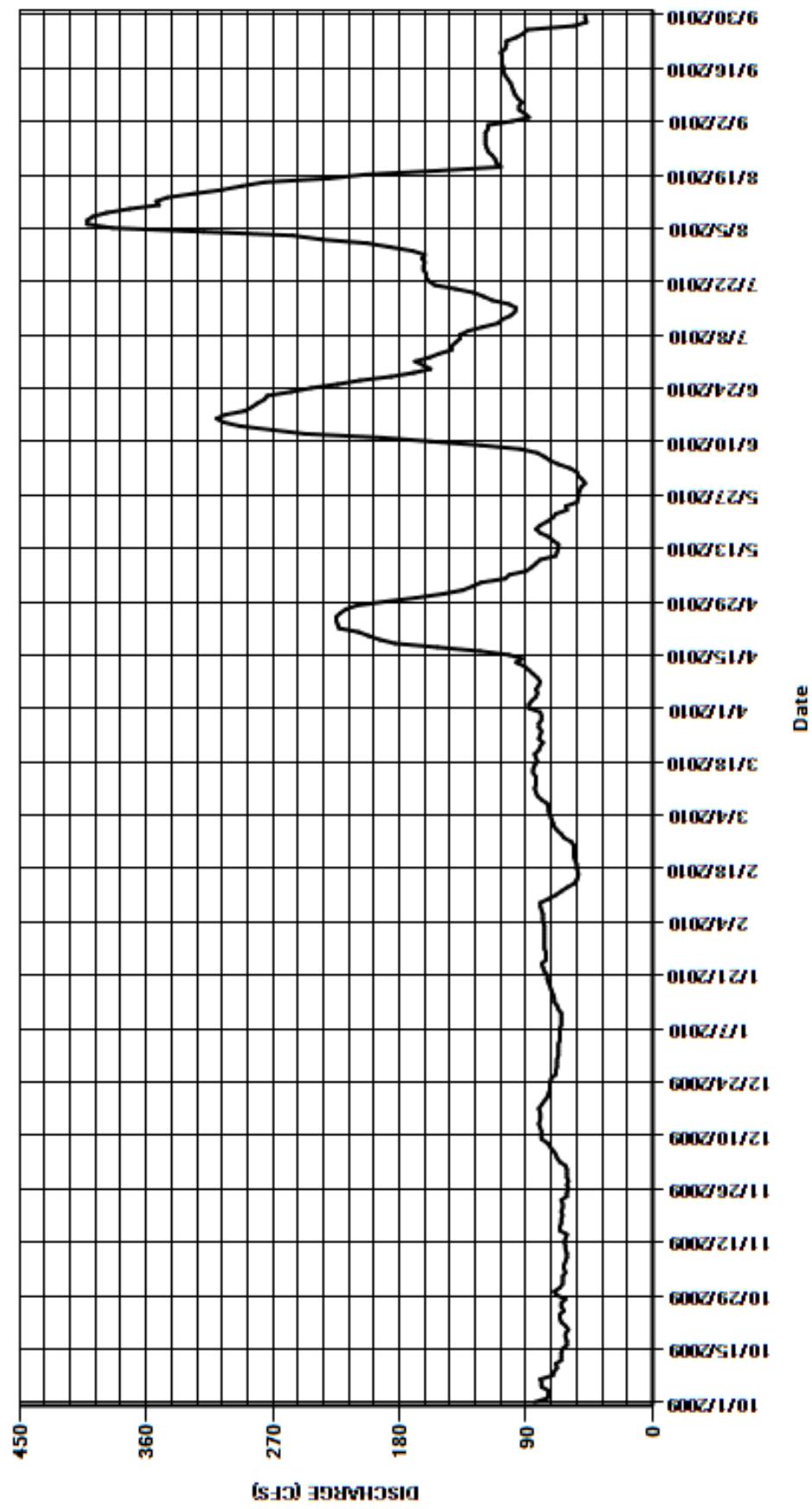
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	84	64	61	67	77	70	88	149	53	169	203	117
2	75	64	62	67	77	71	88	135	54	159	236	100
3	74	64	66	67	77	72	86	128	59	152	256	88
4	74	62	68	66	78	73	83	122	67	143	319	91
5	79	63	69	66	78	74	82	105	73	143	384	95
6	79	63	71	66	78	74	83	102	77	140	402	95
7	80	62	73	66	79	75	81	90	82	137	402	93
8	71	61	75	65	80	79	80	86	94	137	398	96
9	70	61	79	65	80	82	82	83	122	131	388	98
10	68	62	79	65	74	83	85	80	158	121	372	99
11	69	62	79	65	69	84	88	69	193	110	351	100
12	65	63	80	67	65	83	91	68	247	107	353	101
13	65	62	81	68	61	83	97	67	270	101	345	103
14	65	61	80	70	56	83	93	67	293	98	326	105
15	64	66	80	70	54	85	102	71	305	97	306	106
16	61	66	80	71	53	85	123	74	310	102	292	106
17	61	65	81	72	53	84	153	80	304	114	276	107
18	62	65	79	73	54	82	183	83	290	120	230	107
19	62	64	77	74	54	83	194	80	285	127	205	107
20	60	65	75	75	55	84	202	75	281	140	153	108
21	62	64	74	75	56	81	209	71	276	155	108	105
22	65	64	73	77	56	80	223	69	274	159	111	104
23	66	65	73	78	56	78	224	61	257	161	112	104
24	66	61	73	79	56	81	225	62	243	161	114	97
25	63	61	72	76	58	80	225	54	224	163	117	92
26	65	60	69	76	63	79	222	53	208	163	118	89
27	65	61	69	76	65	81	218	53	186	162	119	56
28	62	60	68	77	68	81	210	52	170	164	119	47
29	68	61	68	77	---	79	190	51	158	162	119	48
30	70	61	68	77	---	79	168	48	163	171	119	48
31	66	---	67	77	---	80	---	50	---	187	117	---
TOTAL	2106	1883	2269	2210	1830	2468	4278	2438	5776	4356	7470	2812
MEAN	67.9	62.8	73.2	71.3	65.4	79.6	143	78.6	193	141	241	93.7
AC-FT	4180	3730	4500	4380	3630	4900	8490	4840	11460	8640	14820	5580
MAX	84	66	81	79	80	85	225	149	310	187	402	117
MIN	60	60	61	65	53	70	80	48	53	97	108	47
CAL YR	2009	TOTAL	43401	MEAN	119	MAX	469	MIN	29	AC-FT	86090	
WTR YR	2010	TOTAL	39896	MEAN	109	MAX	402	MIN	47	AC-FT	79130	

MAX DISCH: 417 CFS AT 16:30 ON Aug. 06,2010 GH 3.41 FT. SHIFT 0.03 FT.

MAX GH: 3.41 FT. AT 16:30 ON Aug. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK AT BORDEN DITCH
Water Year 2010

Location.--	Lat. 39°17'13", Long. 105°41'43", in the NW ¼ of the NW ¼ of Sec. 8, T. 9 S., R. 74 W., Park County, Hydrologic unit 10190001, on left bank 1800 ft. downstream from Rock Creek, 9 mi. southeast of Jefferson and 1.0 mi. northwest of Bordenville.
Drainage and Period of Record.--	230 mi ² . Apr. 26, 1983 (no previous gage at this site). Operation discontinued by USGS Sept 30, 1997. Taken over by Colorado Division of Water Resources.
Equipment.--	Sutron SatLink 2 satellite monitoring data collection platform (DCP) with a Sutron 56-0540 shaft encoder (SE) enclosed in a steel box shelter atop a 18 inch corrugated metal pipe (CMP) mounted vertically on the stream bank. Well has a clean-out door on the stream side. The primary gage reference is a drop tape with shelf mounted reference point (RP). There is a supplementary outside staff gage. The gage and satellite monitoring equipment are owned and maintained by the City of Aurora. Aurora operates the gage seasonally and it is shut down in the winter. Colorado Division of Water Resources (DWR) operates the gage under a contract with City of Aurora to provide real time data and for record development.
Hydrologic Conditions.--	High mountain alluvial plateau mostly devoid of forest. Conditions remain stable with continued light residential development upstream. Discharge affected by irrigation diversions, releases from Jefferson Lake and James Tingle reservoir.
Gage-Height Record.--	Primary record is hourly averages of telemetered 15-minute satellite data. The record is complete and reliable except as follows. October 19, 2009 and April 21, 2010: incomplete data, estimated record (shut-down for winter and start-up days). October 20, 2009 through April 20, 2010: station off for winter, no record maintained. Instrument calibration was verified by twenty one visits made to the gage. Two SE adjustments were made (0.01 and 0.02 ft.).
Datum Corrections.--	Levels were run on August 12, 2010 to the reference point (RP) using Reference Mark No. 1 (RM1) as base. Levels revealed the RP elevation was 0.02 feet lower than found last year. The gage is susceptible to movement following harsh winters experienced in this area. It is assumed the gage had shifted following winter. As such, a datum correction of -0.02 feet was applied from the spring startup of April 21 to August 16, 2010 when the first measurement was made following levels. Rather than adjusting the RP, it was relocated and re-indexed to an elevation of 9.915 feet. Relocation of the RP was critical to resolve difficulties associated with reading the RP in its previous configuration. The metal tape length was then adjusted to 9.915 ft. RM1 - 7.034 feet ,RM3 - 8.505 feet, RM2 - Elevation for RM2 abandoned (9/28/2009).
Rating.--	The control at low to medium flows is a rock riffle downstream composed of gravel, sand and some large boulders. The stream channel is the control for higher stages up to an approximate gage-height of 6.00 ft where the channel is subject to overflow. The gage is approximately 100 ft. upstream. Rating No. 6 was used all year and is well defined between 1.11 and 247 cfs. It is valid for the range of flows experienced this year. Ten measurements were made (Nos. 80 - 89), ranging in discharge from 17.5 to 208 cfs. Average daily flow was above the highest measurement on the following days: June 12-15, 2010. The peak discharge of 304 cfs occurred at 1315 on June 13, 2010 at a gage height of 4.10 ft. with a shift of 0.05 ft. and a datum correction from levels of -0.02 ft. It exceeded measurement No. 83 by 0.53 ft. in stage and 96 cfs respectively.
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed mainly by time with some consideration to change in stage. Unadjusted shifts ranged from 0.00 to 0.06 feet. Measurement No. 87 was adjusted by 2 % to better match adjacent shifts. Shifting is caused by the movement of material (sand, silt, rocks, and boulders) across the control and gage pool sections. The range in stage experienced this year was confined to the channel. Frost heave can affect the first measurements of the spring, since the creek thaws before the ground. Shifts were applied as follows. October 1-19, 2009: stage shift table TARBORCO VST2 from WY 2009 defined by measurements Nos. 73-80. April 21 through September 30, 2010: time proration applied as defined by measurements and distributed mainly by time with some consideration to change in stage. Shifts for Msmt. Nos. 83 and 86 held to peak events. This is a partial year record. No discharge record is kept for the winter period.
Special Computations.--	Discharge from Tarryall Cr. bl. Tarryall Reservoir gage used to help assess for possible ice effect at this gage during October 2009.
Remarks.--	The record is rated good, except for the start up and shut down days of October 19, 2009 and April 21, 2010 which were estimated and are considered poor. No estimates were made for the winter period from October 20, 2009 through April 20, 2010 as the gage is considered seasonal. Station maintained and record developed by Mike Wild.
Recommendations.--	Gage shelter should be replaced. Access to the gage will be improved during construction to County Road 77 scheduled for summer 2011 allowing gage work to proceed in the fall.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

TARRYALL CREEK AT BORDEN DITCH

RATING TABLE--

TARBORCO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

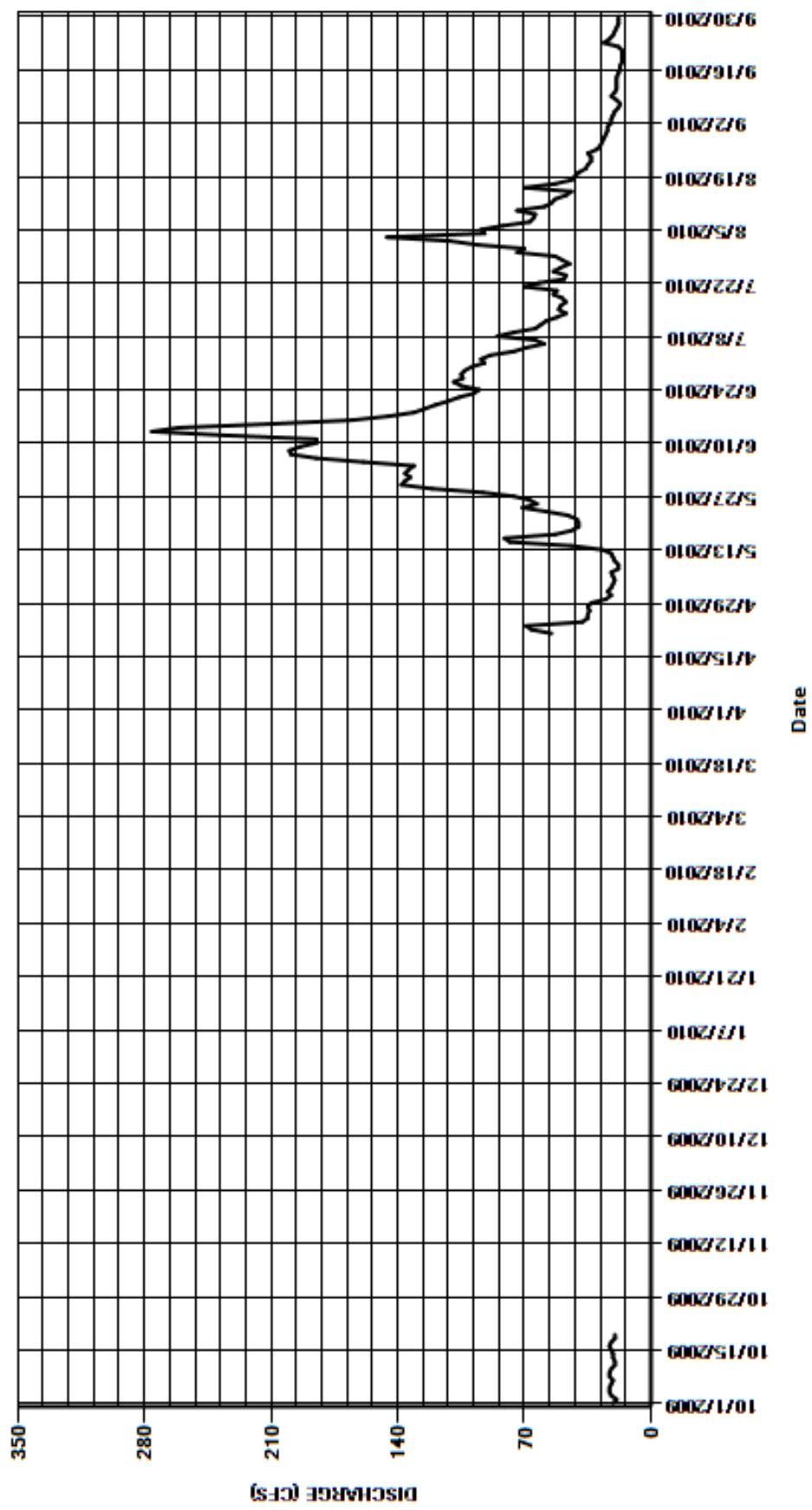
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	---	---	---	---	---	---	22	133	92	96	24
2	19	---	---	---	---	---	---	24	136	94	111	22
3	22	---	---	---	---	---	---	22	134	89	146	22
4	23	---	---	---	---	---	---	21	131	76	92	21
5	23	---	---	---	---	---	---	20	159	69	94	20
6	22	---	---	---	---	---	---	21	185	59	82	18
7	21	---	---	---	---	---	---	22	199	64	67	17
8	23	---	---	---	---	---	---	18	200	85	65	19
9	23	---	---	---	---	---	---	18	194	76	64	22
10	22	---	---	---	---	---	---	20	185	64	74	20
11	20	---	---	---	---	---	---	21	185	61	59	19
12	20	---	---	---	---	---	---	22	235	58	55	19
13	21	---	---	---	---	---	---	27	276	52	53	19
14	21	---	---	---	---	---	---	44	261	47	47	19
15	22	---	---	---	---	---	---	78	210	51	44	18
16	23	---	---	---	---	---	---	81	165	50	70	17
17	22	---	---	---	---	---	---	53	145	47	53	17
18	20	---	---	---	---	---	---	44	131	49	44	16
19	20	---	---	---	---	---	---	40	125	54	42	16
20	---	---	---	---	---	---	---	40	119	52	40	16
21	---	---	---	---	---	---	55	41	112	70	36	16
22	---	---	---	---	---	---	66	46	106	62	35	18
23	---	---	---	---	---	---	69	58	98	48	33	26
24	---	---	---	---	---	---	38	71	95	47	33	23
25	---	---	---	---	---	---	35	63	105	54	35	21
26	---	---	---	---	---	---	35	67	109	50	30	20
27	---	---	---	---	---	---	34	76	104	45	28	19
28	---	---	---	---	---	---	35	93	105	49	27	18
29	---	---	---	---	---	---	33	121	103	53	26	18
30	---	---	---	---	---	---	25	138	99	74	25	18
31	---	---	---	---	---	---	---	136	---	70	24	---
TOTAL	408	---	---	---	---	---	425	1568	4544	1911	1730	578
MEAN	21.5	---	---	---	---	---	42.5	50.6	151	61.6	55.8	19.3
AC-FT	809	---	---	---	---	---	843	3110	9010	3790	3430	1150
MAX	23	---	---	---	---	---	69	138	276	94	146	26
MIN	19	---	---	---	---	---	25	18	95	45	24	16
CAL YR	2009	TOTAL	14443	MEAN	76	MAX	283	MIN	18	AC-FT	28650	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	11164	MEAN	61.3	MAX	276	MIN	16	AC-FT	22140	(PARTIAL YEAR RECORD)

MAX DISCH: 304 CFS AT 13:15 ON Jun. 13,2010 GH 4.1 FT. SHIFT 0.05 FT. (DATUM CORR. OF -0.02 FT APPLIED)

MAX GH: 4.1 FT. AT 13:15 ON Jun. 13,2010 (DATUM CORR. OF -0.02 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK AT BORDEN DITCH
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK BELOW TARRYALL RESERVOIR
Water Year 2010

Location.--	Lat. 39°13'18", Long. 105°36'07"; in SW1/4 of sec 31, T. 9S, R. 73W, Park County, about 500 ft. downstream from Tarryall Reservoir.
Drainage and Period of Record.--	355 sq. mi., from DWR Dam Safety Section database. Age of the gage is not known, although the reservoir was built in 1929. DWR first ran levels in June of 1975, and installation in 1970's is consistent with the type of materials used. The gage has been operated infrequently and records have never been kept prior to 2005.
Equipment.--	Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE) in a 36-inch CMP structure located on the right downstream abutment of a bridge on Park County Road 77. Gage is operated and equipment is maintained by the Colorado Division of Water Resources (DWR) under a cooperative agreement with the Colorado Division of Wildlife (DOW), the owner of Tarryall Reservoir. There is an inside reference tape and a staff gage on the center abutment of the bridge.
Hydrologic Conditions.--	High mountain alluvial plateau mostly devoid of forest. Conditions remain stable with continued light residential development upstream. Discharge affected by irrigation diversions, releases from Jefferson Lake and James Tingle reservoir. Natural flow of stream affected by storage in Tarryall Reservoir and diversions for irrigation and return flow from irrigated areas.
Gage-Height Record.--	Primary record is hourly averages of 15-minute telemetered shaft encoder data. The record is complete and reliable, except as follows. November 9, 2009 and April 14, 2010: incomplete data, estimated record (gage shut-down for winter and start-up days). November 10, 2009 through April 15, 2010: station off for winter, no record maintained. Instrument calibration was verified by twenty one visits made to the gage. One SE adjustment of -0.01 ft was made on May 5, 2010.
Datum Corrections.--	Levels were run last on August 27, 2008 from the reference mark on the southwest bridge abutment to the reference point (RP) by DWR personnel. RP was found to be 0.014 ft low. No correction was made.
Rating.--	Rating TARTARCO03 was developed from measurements made from the last two water years and was placed into service July 29, 2010. It is defined by measurements from 3.65 to 289 cfs. TARTARCO03 rating was applied to entire water year 2010. Negative shifting is caused by moss growth, which develops throughout the summer and continues until fall when the gage is deactivated for winter. Channel consists of rock, cobble and gravel. Shifting is caused by the movement of this material across the control. Frost heave can affect the first measurements of the spring, since the creek thaws before the ground does. Fifteen measurements (Nos. 127 – 141) were made this year ranging in discharge from 2.47 to 270 cfs. The rating is defined to 289 cfs; flows above 433 cfs are to be considered estimated. There were no flows above 433 cfs this water year. The peak discharge of 273 cfs occurred at 0545 on June 14, 2010 at a gage height of 4.14 ft. with a shift of -0.04 ft. It exceeded measurement No. 133 by 0.01 ft. in stage and 3.0 cfs respectively.
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and distributed with consideration to stage. Measurement shifts ranged from -0.05 to 0.04 ft. A beaver dam formed late in October 2009 which affected the stage discharge relationship, a negative shift was applied for the period using on site observations and measurement No. 128. Shifts were applied as follows: October 1, to November 9, 2009; Time proration as defined by measurement Nos. 126-128. April 14 to the peak discharge on June 14, 2010: stage dependent shifting using variable shift table TARTARCOVST1 which is defined by five measurements (Nos. 128-133) made during the period of use. June 12 to September 30, 2010: time proration as defined by measurements (Nos. 134-142).
Special Computations.--	A mass balance spreadsheet was used to compare discharge to the upstream TARBORCO gage. Consideration must be given to irrigation diversions, evaporative losses and transit delay though Tarryall reservoir.
Remarks.--	The record is rated good. Discharge estimates made for the shut down and start days of November 9, 2009 and April 14, 2010 are considered fair. This is a partial year record; data is not available for November 10 to April 15. However, one discharge measurement was made while the gage was out of service: No. 129, 2.47 cfs; January 11, 2010. Station maintained and record developed by Mike Wild.
Recommendations.--	Federal Highway Commission is planning to replace bridge and gage shelter in 2011; plans have been submitted for the project. DWR will need to work with the selected contractor to ensure the gage is completed according to drawings.

STATE OF COLORADO
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TARRYALL CREEK BELOW TARRYALL RESERVOIR

RATING TABLE--

TARTARCO03 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	14	---	---	---	---	---	21	130	91	79	24
2	19	17	---	---	---	---	---	19	129	87	110	23
3	19	18	---	---	---	---	---	18	132	88	137	22
4	20	19	---	---	---	---	---	18	129	81	141	21
5	21	19	---	---	---	---	---	17	131	73	107	20
6	21	19	---	---	---	---	---	16	160	66	100	19
7	21	19	---	---	---	---	---	16	181	61	87	18
8	21	19	---	---	---	---	---	16	192	68	75	18
9	23	20	---	---	---	---	---	15	195	77	71	19
10	23	---	---	---	---	---	---	15	185	72	73	18
11	22	---	---	---	---	---	---	15	181	65	72	18
12	21	---	---	---	---	---	---	15	196	62	65	18
13	21	---	---	---	---	---	---	17	238	57	61	18
14	22	---	---	---	---	---	65	22	267	50	55	18
15	23	---	---	---	---	---	66	44	233	44	48	17
16	23	---	---	---	---	---	73	67	183	46	53	17
17	23	---	---	---	---	---	75	66	144	44	62	16
18	23	---	---	---	---	---	63	53	123	44	55	16
19	23	---	---	---	---	---	61	42	111	47	47	15
20	22	---	---	---	---	---	60	35	107	52	43	15
21	22	---	---	---	---	---	58	32	104	71	39	15
22	22	---	---	---	---	---	62	32	100	74	36	15
23	21	---	---	---	---	---	70	36	94	67	33	18
24	20	---	---	---	---	---	62	48	90	57	33	20
25	20	---	---	---	---	---	43	59	90	51	33	20
26	18	---	---	---	---	---	34	60	98	52	33	19
27	17	---	---	---	---	---	30	63	101	49	31	19
28	17	---	---	---	---	---	28	71	99	46	29	18
29	14	---	---	---	---	---	28	88	99	47	28	17
30	13	---	---	---	---	---	26	118	96	62	26	17
31	13	---	---	---	---	---	---	131	---	71	25	---
TOTAL	628	164	---	---	---	---	904	1285	4318	1922	1887	548
MEAN	20.3	18.2	---	---	---	---	53.2	41.5	144	62	60.9	18.3
AC-FT	1250	325	---	---	---	---	1790	2550	8560	3810	3740	1090
MAX	23	20	---	---	---	---	75	131	267	91	141	24
MIN	13	14	---	---	---	---	26	15	90	44	25	15

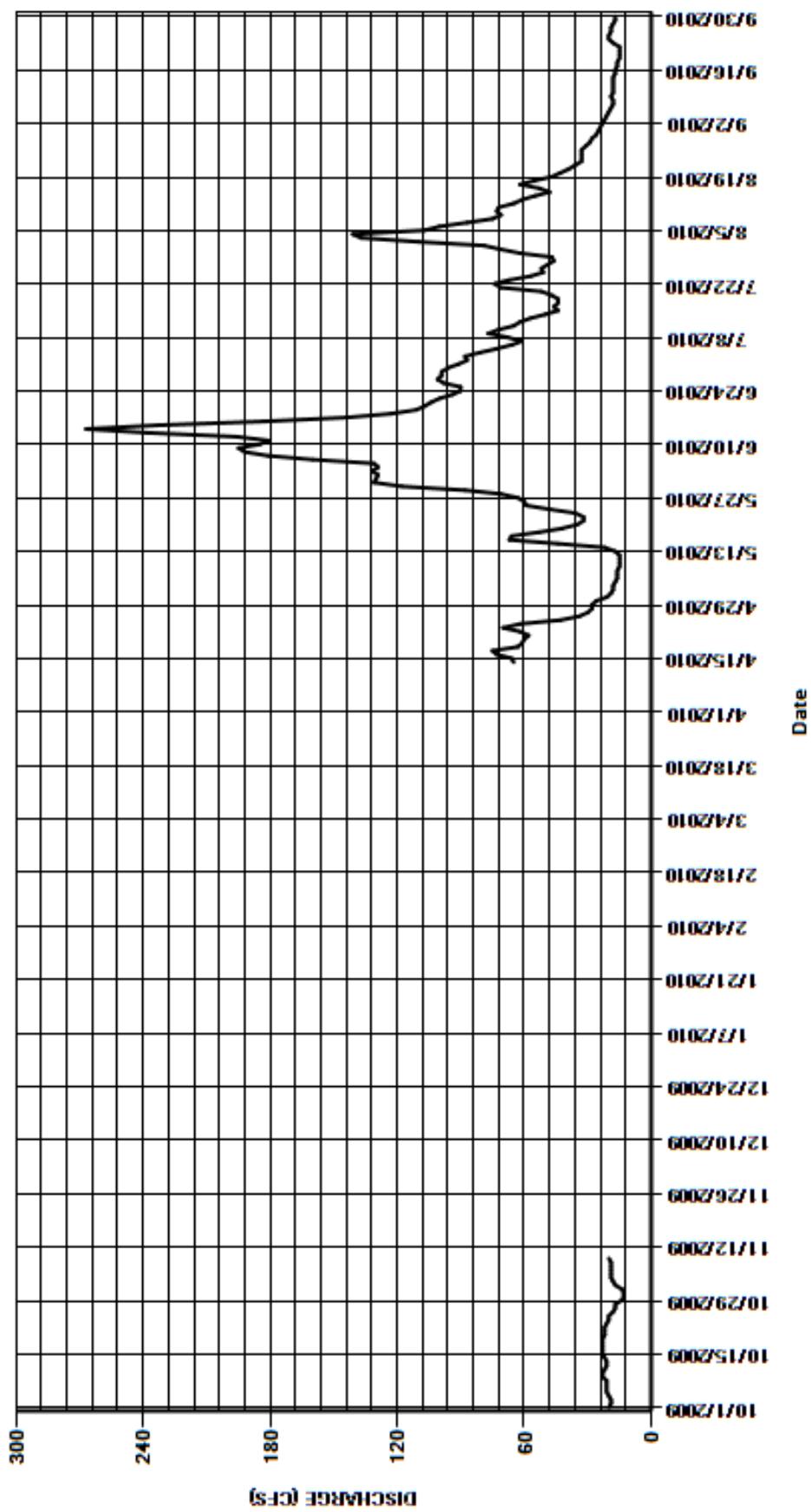
CAL YR	2009	TOTAL	15203	MEAN	70.4	MAX	297	MIN	13	AC-FT	30160	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	11656	MEAN	55.5	MAX	267	MIN	13	AC-FT	23120	(PARTIAL YEAR RECORD)

MAX DISCH: 273 CFS AT 05:45 ON Jun. 14,2010 GH 4.14 FT. SHIFT -0.04 FT.

MAX GH: 4.14 FT. AT 05:45 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK BELOW TARRYALL RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR
Water Year 2010

Location.--	Lat. 39°12'33", Long. 105°16'02", in SE 1/4 NW 1/4 sec. 6, T. 10 S., R. 70 W., Jefferson County, Hydrologic Unit 10190002, on left bank 1,400 ft downstream from toe of Cheesman Dam and 3.8 mi southwest of Deckers.
Drainage and Period of Record.--	1,752 mi ² . Oct. 1, 1924-May 13, 1956 at site 370 feet upstream and 0.50 ft. higher. May 14, 1956 to present at current site. Unreliable record from 1909 to 1924 unpublished.
Equipment.--	Sutron SatLink 2 satellite Data Collection Platform (DCP) with a Sutron 56-0540 shaft encoder (SE); a Sutron Stage-discharge recorder (SDR) in a concrete shelter and concrete well on left bank adjacent to a 30-foot concrete Parshall flume. No outside staff gage is present. The station and flume are owned and maintained by the Denver Water Board (DWB). The satellite equipment is owned and maintained by the Division of Water Resources (DWR).
Hydrologic Conditions.--	Cheesman Reservoir is in the center of the 2002 Hayman burn area. The fire severely damaged the watershed and the Denver Water Board has performed extensive erosion control in the area surrounding the reservoir. Major revegetation efforts were performed in the burn area to reduce erosion and water quality problems.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with SDR back up. The primary record agrees with SDR data to within 0.02 ft. The record is complete and reliable, except for July 20, 2010 which was missing 7 hours due to shelter replacement. This data was estimated by presuming constant release. The satellite equipment (DCP and SE) were removed from the gage shelter on June 23, 2010 to facilitate installation of a new shelter which was completed on July 20, 2010. In preparation for this, an SDR logger was installed on September 10, 2009 in a weatherproof enclosure below grade in the stilling well. Data from the SDR was used from June 23, to July 20, 2010. Eighteen visits were made to the gage. One SE/SDR adjustment was made on September 14, 2010. Due to the flume's proximity to the dam, ice accumulation in the approach, flume, and departing sections is normally not an issue and was not this year. However, the flume is subject to moss and algal growth. One flume cleaning correction of -0.04 feet occurred on April 27, 2010. The correction was prorated by time as a datum correction back to flow change event at 1100 April 16, 2010. Two flume cleaning corrections November 24, 2009 and September 14, 2010 were addressed with shifting as measurements were performed before the flume cleanings were made.
Datum Corrections.--	Levels were run on September 10, 2009 when the SDR was installed in the stilling well in anticipation of the gage house replacement. A temporary reference point (RP) was installed in the well for the SDR calibration during construction. The gage was found to be reading correctly, either from the existing RP or the temporary RP installed in the well. Levels were run after the installation of the new gage house on July 20, 2010. The ETG was reset on the new instrument shelf and a new metal tape was indexed at 13.604 ft. However, levels were not run to temporary RP for the SDR which was used for primary data from June 23 to July 20, 2010. When the RP for the SDR was put into use on June 23, it showed the same GH as the existing RP. On July 20, the RP board for the SDR was observed to be bowed and had footprints on it. It is presumed that contractors had found a need to step on it during the shelter replacement, sometime between June 23 and July 20. A presumptive levels RP correction of 0.03 ft. was arrived at by noting the release was constant on July 20. The GH on the new RP at 1515 was 0.03 ft higher than the GH from the SDR at 0940. This 0.03 ft. correction was taken up in shifts run from July 9 to July 21, 2010.
Rating.--	The control is a concrete 30-foot Parshall flume with a modified rating. The flume submerges at flows near the 1000 cfs range due to constrictions in the channel below the gage. Rating No. 11 was developed in 1995 to compensate for submergence and was continued in use for the current year. Submergence seems to begin when the measurement section velocity reaches around 6.6 feet/sec. The rating is well defined except for flows around 1,000 cfs where submergence appears to cause a break point in the slope of the curve. Shifts historically were positive unless moss accumulation occurs which can cause negative shifting. However as the approach pool has filled, shifts have become more positive. Gravel deposition occurred on the left side of the upstream channel and the flume converging section during a precipitation event on July 21, 2009. An effort was made to remove the gravel on LEW on July 7, 2010 but had little effect on shifting; the entire weir pool would have to be excavated to reduce velocities to 0.5 fps. Comparisons of velocities to measurements taken in 1995 show the effects of the approach pool filling with elevated velocities at comparable depths. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 30 ft Parshall Flume is 15 to 1500 cfs. Anything above or below this range is outside the +/- 5% accuracy range. Given this fact, flows below 15 cfs at gage height 0.38, or above 1500 cfs at gage height of 5.94 the record would be considered fair. All flows in water year 2010 were within the +/- 5% range of accuracy. Sixteen measurements (Nos. 228-244) were made this year, ranging in discharge from 37.9 to 729 cfs. The rating is well defined for the ranges of flow experienced. The measurements covered the range of discharge experienced except the higher mean daily flows on June 16-17, 2010. The peak flow of 777 cfs occurred at 1945 on June 16, 2010 at a gage height of 3.26 feet with a shift of 0.12 ft. It exceeded measurements Nos. 236, made on June 16, 2010, by 0.13 feet in stage.
Discharge.--	Shifting control method was used all year. Stage dependent shifting was used for the majority of the year with the exception of periods where moss accumulation could be identified and shifts were applied as defined by measurements and were distributed mainly by time with consideration to change in stage. Negative shifts occur when moss accumulates on the crest of the flume. The range in stage experienced this year was confined to the weir section. Measurements for the water year show shifts varying from -0.04 ft. to 0.12 ft. Shifts were distributed as follows. October 1-26, 2009: time distribution with consideration to stage, Msmt No. 227 applied to October 9, 2009 (0.01). Measurements given full weight. October 26 to November 24, 2009: time distribution. Measurements given full weight. November 24 to July 9, 2010: variable shift table PLACHECOVST10-1 developed from Msmt Nos. 230-238 made during the period was used. Msmt Nos. 230 and 235 were discounted 2% and 1%, respectively, to better fit the shift curve. July 9, to July 21, 2010: time distribution including a presumptive levels correction of +0.03 ft. made on July 20. July 9, No. 238 (full weight) shift of +0.06 ft was prorated to +0.04 ft at 0900 on July 20, which marked the end of the use of GH's from the temporary installation. July 20 (1000) (new shelter, new RP) to July 21 measurement (full weight), a +0.01 ft shift applied straight through. July 21 to August 26, 2010: variable shift table PLACHECOVST10-2 developed from Msmt Nos. 239-241 made during the period was applied. Measurements given full weight. August 26 to September 30, 2010: Time distribution . Measurements given full weight.

Special Computations.--	Flume cleaning corrections are handled differently depending on whether it is the State or DWD perform the cleaning. If the gage height drops as a result of a DWD flume cleaning, it usually occurs between measurements, it is Denver's procedure to increase the release so that the same gage height is maintained. A datum correction is applied to account for the moss accumulation. Generally if the flume is cleaned by a State Hydrographer, a measurement is made before and after the flume cleaning with shifts applied accordingly.
Remarks.--	The record is considered good, except for July 20, 2010 which is estimated and poor due to missing data during the shelter replacement, and a possible problem with the reference point in use. Station maintained and record developed by Mike Wild.
Recommendations.--	Develop new rating. Install staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR

RATING TABLE--

PLACHECO11 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

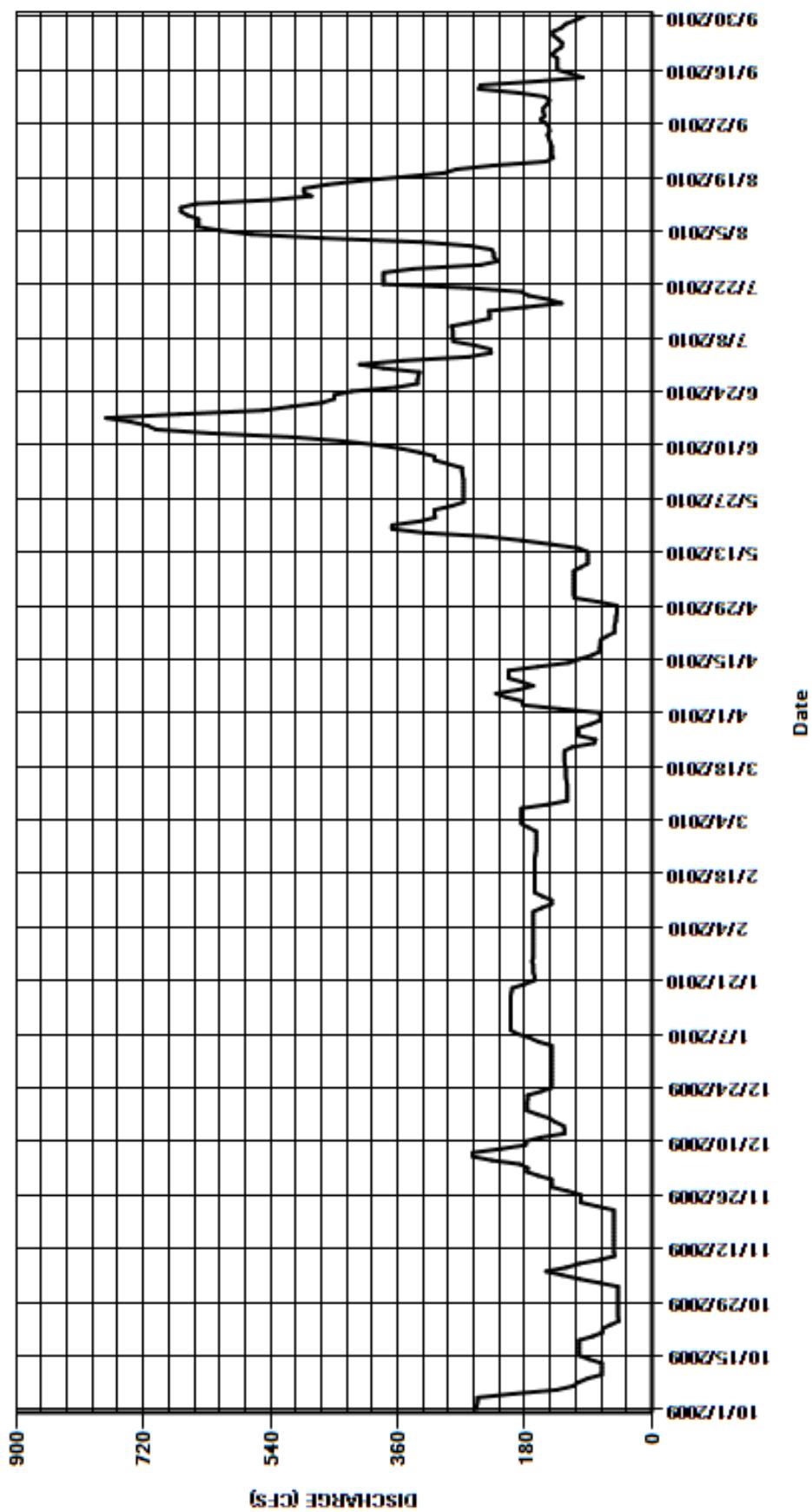
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	249	48	161	142	168	164	74	110	267	414	258	146
2	248	48	177	142	168	175	131	111	268	352	326	150
3	247	75	176	142	168	185	183	111	269	259	466	158
4	247	103	187	142	168	185	183	111	269	228	567	152
5	196	127	227	161	168	185	206	111	289	229	611	154
6	135	150	254	173	168	185	221	111	308	251	643	154
7	112	121	254	190	168	185	189	111	308	281	642	149
8	104	103	214	200	168	147	168	111	329	282	642	145
9	91	74	179	200	156	120	184	101	355	282	658	152
10	71	53	179	200	142	120	203	91	392	282	667	190
11	71	54	157	200	142	120	203	91	440	284	667	245
12	71	54	124	200	155	120	203	91	508	255	645	243
13	71	54	124	200	166	120	162	91	625	230	539	161
14	89	54	125	200	166	121	118	104	702	230	482	98
15	103	54	137	200	166	122	103	143	714	231	493	115
16	103	54	145	200	166	122	85	184	738	178	493	134
17	103	54	162	200	166	122	74	233	773	128	460	134
18	103	54	177	199	166	123	74	322	669	147	413	134
19	103	54	177	198	166	124	73	368	551	175	354	134
20	84	54	177	181	166	124	73	368	511	185	295	142
21	70	54	176	167	166	124	64	329	467	259	277	136
22	70	54	176	166	166	124	53	307	450	381	225	128
23	59	78	157	168	165	113	53	308	450	380	151	127
24	47	101	142	168	164	82	53	308	425	380	140	133
25	48	101	142	168	164	80	51	284	362	380	142	140
26	48	101	142	170	164	104	51	267	332	338	142	140
27	48	120	142	168	164	104	50	267	332	243	142	128
28	48	142	142	168	164	104	50	267	331	218	144	122
29	48	142	142	168	---	87	50	267	329	224	146	108
30	48	142	142	168	---	73	77	267	380	224	148	96
31	48	---	142	168	---	73	---	267	---	227	145	---
TOTAL	3183	2477	5158	5517	4584	3937	3462	6212	13143	8157	12123	4348
MEAN	103	82.6	166	178	164	127	115	200	438	263	391	145
AC-FT	6310	4910	10230	10940	9090	7810	6870	12320	26070	16180	24050	8620
MAX	249	150	254	200	168	185	221	368	773	414	667	245
MIN	47	48	124	142	142	73	50	91	267	128	140	96
CAL YR	2009	TOTAL	79860	MEAN	219	MAX	875	MIN	47	AC-FT	158400	
WTR YR	2010	TOTAL	72301	MEAN	198	MAX	773	MIN	47	AC-FT	143400	

MAX DISCH: 777 CFS AT 19:45 ON Jun. 16,2010 GH 3.26 FT. SHIFT 0.12 FT.

MAX GH: 3.26 FT. AT 19:45 ON Jun. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06701500 SOUTH PLATTE RIVER BELOW CHEESEMAN RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
NORTH FORK SOUTH PLATTE RIVER AT GRANT
Water Year 2010

Location.--	Lat. 39°27'26", Long. 105°39'29" in NW¼ sec. 10, T.7 S., R.74 W., Park County, Hydrologic Unit 10190002, on left bank at Grant, 1,550 ft downstream from Geneva Creek, and 1.3 mi downstream from east portal of Harold D. Roberts tunnel.
Drainage and Period of Record.--	127 mi ² ; 1948 to present.
Equipment.--	Graphic water stage recorder and satellite monitoring equipment in a wooden shelter over a concrete well at a concrete trapezoidal channel section and spillway. The gage has residential power and is equipped with a heater and a heat lamp to prevent freezing of the stilling well. The station, with the exception of satellite and other recording equipment, is owned and maintained by the Denver Water Department. The satellite equipment is owned by the Office of the State Engineer.
Hydrologic Conditions.--	Pine forest at 8500 ft to 9500 ft. Gage is affected by natural stream flows from Kenosha Creek, Geneva Creek and discharges from the East Portal of the Roberts tunnel. Rapid changes in stage are caused by the regulation of Roberts Tunnel, ½ mile upstream. When Roberts Tunnel is operating, the gage is typically free from ice.
Gage-Height Record.--	The primary record is hourly averages of 15 minute data taken from satellite monitoring with chart back up. The record is complete and reliable, except for periods when the gage was affected by ice due to Roberts's Tunnel being turned off: October 29-31; November 2, 3, 5; November 28, 2009 thru March 20, 2010. November 1, 4, 27 had minor affect but were estimated without loss of accuracy.
Datum Corrections.--	Levels were last run on August 27, 2008 and the gage was found to be reading within the ±.02 ft. tolerances. No instrument corrections were needed. Levels were not run this water year.
Rating.--	The control through all stages up to 4.0 feet is a broad crested weir with slightly raised edges. Flow over control has free getaway and should not become submerged. Both banks are clean up to 5 feet of stage. Channel is straight for 500+ feet upstream and downstream. The streambed leading up to the broad crested weir consists of rock and cobble and is affected by high flows during runoff and releases from Roberts Tunnel. Shifts are caused by scour and fill of the weir pool and by gradual erosion of the control. Rating 12 has been in use since October 1, 2001 and was continued in use for the entire year. It is defined by measurements from 15.6 to about 700 cfs. Sixteen measurements (Nos. 1077 – 1092) were made this year (including ice measurements), ranging in discharge from 13.2 to 540 cfs. Daily flows for 2010 did not exceed the defined range for the control. The peak flow of 605 cfs occurred at 2315 on June 7, 2010 at a gage height of 1.84 ft. with a shift of -0.01 ft. It exceeded measurement number 1087 made June 10, 2010 by 0.08 ft. in stage.
Discharge.--	Shifting control method was used all year. Shifts were distributed using two variable shift tables; PLAGRACOVST01 before the winter shut down of Roberts Tunnel and PLAGRACOVST02 after the tunnel resumed operation and for the remainder of the water year. Stable gage heights are typical when Roberts Tunnel is on, however this water year saw many adjustments in flow as well as the tunnel being turned off eight times. Variable shift tables gave greater consideration to the wide variety of stage within both time periods, including the peak flow for the year. Unadjusted shifts through the year varied from -0.03 to 0.00 ft. The tables were applied as follows: Table 1 (PLAGRACOVST01) was used from October 1 to November 27, 2009. This table is similar to that used at end of water year 2009. It was adjusted slightly to cover the flows seen through this time period and is based on measurement Nos. 1074-1077, 1084 and 1085. All were given full weight. Table 2 (PLAGRACOVST02) was used from March 21 (No. 1073) to September 30, 2010. It is based on all measurements made during this period: Nos. 1084-1092 plus measurement 1093 made in WY2011. All were given full weight except measurements 1086, 1091 and 1093, which were adjusted from -1 to -3 percent to smooth shift distribution.
Special Computations.--	A spreadsheet is used to compute the daily difference between the Grant gage and Roberts Tunnel. This difference represents the native flow in the North Fork without the Roberts Tunnel. Since this flow should follow trends and should never be negative, the calculation is a reality check on the computation of both records. A hydrograph was used in the development of the shift tables. Discharges for all partial ice days were computed by correcting hourly values using graphic estimates which cut off the ice peaks. Ice affected days when inlets were frozen (Nov 28—March 20) were estimated using winter measurements and temperature trends.
Remarks.--	The record is good with the exception of ice affected periods which are estimated and poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The Roberts Tunnel and North Fork of the South Platte at Grant record should be worked on a monthly basis.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTH FORK SOUTH PLATTE RIVER AT GRANT

RATING TABLE--

PLAGRACO12 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

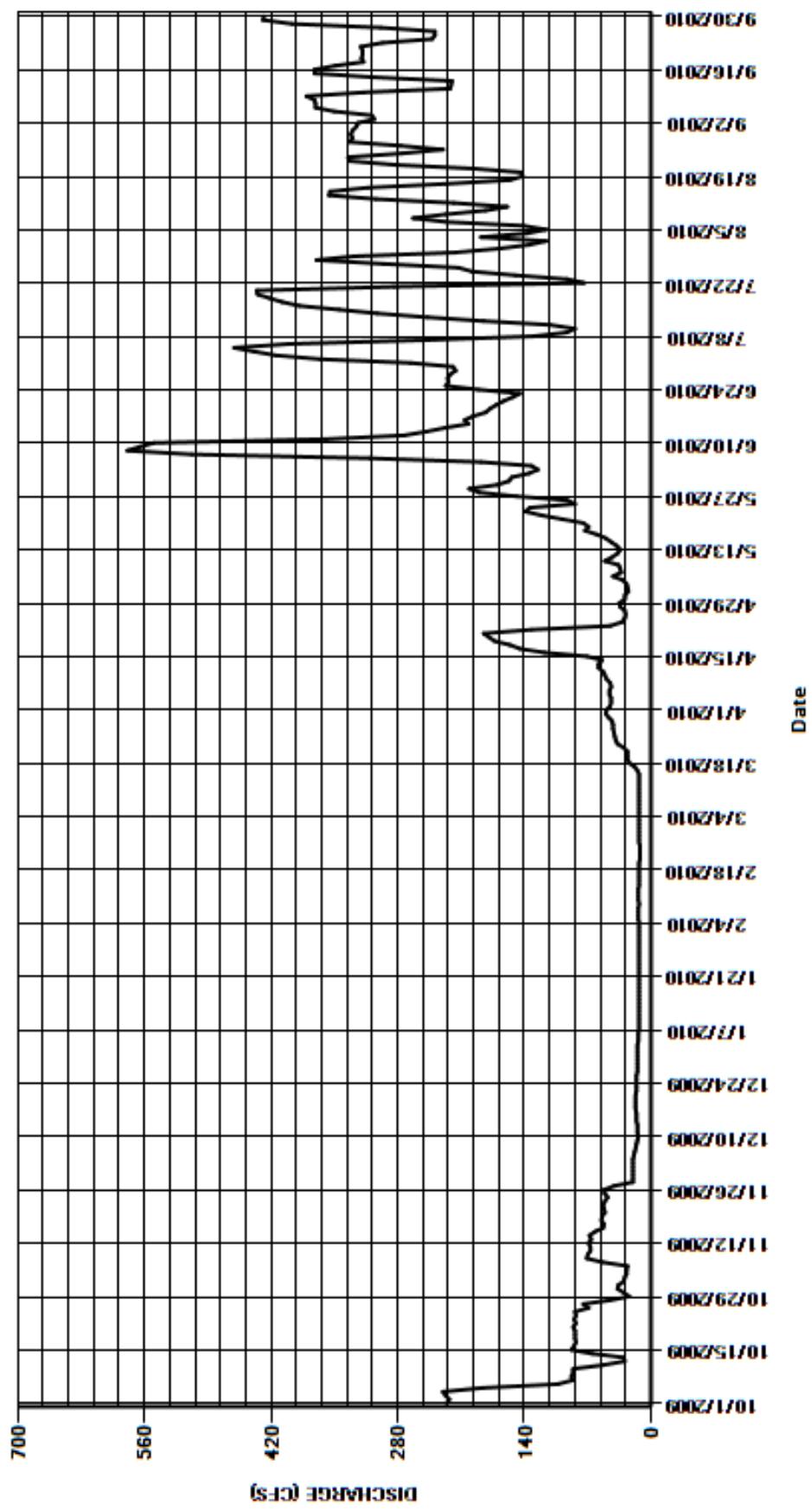
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	226	36	20	15	13	13	49	29	154	266	135	326
2	223	30	20	15	13	13	45	25	135	366	116	324
3	227	29	20	15	13	13	44	26	125	415	188	306
4	230	27	20	14	13	13	44	27	132	439	138	309
5	187	27	19	14	14	13	46	31	188	461	116	350
6	103	26	18	14	14	13	46	42	311	400	141	371
7	87	54	17	13	14	13	44	33	508	248	226	371
8	88	71	16	13	14	13	45	34	579	130	263	372
9	86	70	15	13	13	13	49	36	565	93	227	381
10	86	67	14	13	14	13	51	51	550	84	183	318
11	53	67	15	13	14	13	53	43	359	112	159	222
12	29	69	15	13	14	13	58	37	273	185	218	221
13	30	66	15	13	14	13	58	34	248	247	304	220
14	65	68	16	13	13	13	54	38	227	303	356	308
15	88	62	16	13	13	13	71	44	202	345	355	372
16	85	53	16	13	13	15	118	50	206	389	313	372
17	83	52	17	13	13	18	145	60	197	408	226	349
18	84	55	17	13	13	24	156	73	183	422	156	318
19	84	54	17	13	13	26	173	69	178	435	142	320
20	84	51	17	13	13	26	179	75	171	436	143	319
21	86	52	17	13	12	26	185	98	163	284	196	319
22	83	53	16	13	12	30	132	121	153	74	283	321
23	85	51	16	13	12	37	45	139	145	93	334	297
24	83	48	16	13	12	39	32	134	191	150	335	242
25	84	51	16	13	13	40	29	84	227	198	275	239
26	69	52	16	13	13	41	28	93	224	213	230	239
27	75	41	15	13	13	42	29	149	225	296	277	299
28	46	20	15	13	13	42	34	190	222	370	334	397
29	24	20	15	13	---	43	35	201	216	328	330	429
30	30	20	15	13	---	47	29	170	219	216	332	428
31	37	---	15	13	---	50	---	157	---	168	330	---
TOTAL	2930	1442	512	412	368	741	2106	2393	7476	8574	7361	9659
MEAN	94.5	48.1	16.5	13.3	13.1	23.9	70.2	77.2	249	277	237	322
AC-FT	5810	2860	1020	817	730	1470	4180	4750	14830	17010	14600	19160
MAX	230	71	20	15	14	50	185	201	579	461	356	429
MIN	24	20	14	13	12	13	28	25	125	74	116	220
CAL YR	2009	TOTAL	45500	MEAN	125	MAX	611	MIN	14	AC-FT	90250	
WTR YR	2010	TOTAL	43974	MEAN	120	MAX	579	MIN	12	AC-FT	87220	

MAX DISCH: 605 CFS AT 23:15 ON Jun. 07,2010 GH 1.84 FT. SHIFT -0.01 FT.

MAX GH: 1.84 FT. AT 23:15 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH FORK SOUTH PLATTE RIVER AT GRANT
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
Water Year 2010

Location.--	Lat. 39°24'33", Long. 105°10'10", SE 1/4 sec. 25, T.7 S., R.70 W., Jefferson County, Hydrologic Unit 10190002, on left bank at South Platte, 200 ft downstream from bridge on State Highway 75, and 400 ft downstream from North Fork.
Drainage and Period of Record.--	2,579 mi ² ; 1910 to present.
Equipment.--	Sutron SatLink 2 Data Collection Platform (DCP) with a Sutron shaft encoder (SE); a Sutron stage-discharge recorder (SDR) and a tipping bucket rain gage in a concrete shelter with a 60 inch corrugated stilling well on left bank. There is a 105 foot cableway for measurement of flows greater than 350 cfs just upstream of the gage house. The primary gage is an electric tape gage (ETG) mounted on the equipment shelf. Gage house has 120-volt electricity. The gage is on Denver Water Board property, and a Denver Water Department (DWD) employee will sometimes visit the gage during high flow events. Satellite equipment is owned and maintained by Division of Water Resources (DWR).
Hydrologic Conditions.--	Flow runs through mountainous terrain and is somewhat controlled by releases from Cheesman Reservoir and Robert's Tunnel. A large portion of the watershed contains significant burn areas due to the Hayman, Schoonover and Buffalo Creek fires. However, soil erosion from these fires is stabilizing and turbidity, though still present, is decreasing. Trees and other organic material migrate down river during heavy precipitation events.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart and SDR back up. Checks between the primary and backup record agreed within 0.02 ft. The record is complete and reliable, except November 15, 2009 through February 28, 2010, when there was possible ice affect. Instrument calibration was verified by nineteen visits made to the gage. Two SE adjustments were made; March 15, 2010 (0.01) and on July 9, 2010 (-0.01). Both were prorated to the last visit. The SDR was installed August 12, 2010, 3 missing unit values were filled from on site observations without loss of accuracy.
Datum Corrections.--	Levels were last run on August 27, 2008 and were found to be within the ±.02 ft. tolerances. No instrument corrections were made.
Rating.--	The control is a rock channel and bank at medium and high stages. At low flows a slight narrowing of the channel and a rock riffle downstream (on REW) of the gage act as the control. Channel constriction a quarter mile below the gage may affect extremely high flows. Rating No. 16 (PLASPLCO16) in use since Oct 1, 2002 was continued in use this year. It is defined by measurements to 3350 cfs. Positive and negative shifts are caused by movement of gravel and sand past the gage. Winter ice can also result in shifts at the gage. Eleven measurements (Nos. 822-832) were made this year, ranging in discharge from 194 to 1190 cfs. The measurements covered the range of discharge experienced during non-ice record except for the lower mean daily flows of October 12-14, 29-31, November 1-3, 2009, March 10, 11, 2010; and the higher mean daily flow of June 15, 2010. The peak flow of 1340 cfs occurred at 0530 June 14, 2010 at a gage height of 4.38 ft at a shift of 0.08 ft. It exceeded measurement No. 827, made on June 16, 2010 by 0.22 ft. in stage.
Discharge.--	Shifting control method was used for the entire year. Measurements show shifts varying from 0.00 to 0.13 ft in WY 2010. Shifts were applied as defined by measurements and were distributed by stage from October 1-26, 2009; and by time with consideration to change in stage and event for the remainder of the water year. All measurements were given full weight, except for measurement No. 826 which was adjusted 3% to smooth distribution.
Special Computations.--	Ice affect is not obvious from the GH record. Ice periods are identified by comparing computed record against DWD estimates for computed inflow to Strontia Springs Reservoir, about 2 miles downstream. Generally the computed record will start to greatly exceed the DWD figures shortly after winter cold sets in, and ice record will be considered to begin. Most years the computed figures will remain high until sustained warm weather. When gage figures and DWD figures get close again, ice-affect is assumed to be over. WY2010 had a warmer winter. Temperature information suggested possible ice from November 15, 2009 to February 28, 2010. A spreadsheet is developed for the ice period displaying computed record, Strontia estimates, weather data, and tributary inflows from Cheesman Reservoir and the North Fork of the South Platte at Grant. Ice periods showed up with computed discharges much higher than Strontia inflow and out of line with trends from tributary gages. The ice periods also correlated to periods of sustained below zero temperatures. Inflows into Strontia from DWB accounting were used to estimate discharge for Nov. 15-19; Dec. 8-12, 23-31; and Jan. 1-11. Other days in the ice period used computed discharges rated as Fair.
Remarks.--	The record is good, except for days of possible ice which are rated fair to poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Winter measurements and visits should continue to be made in order to better determine the ice affected days. Measurements should also continue to be made twice a month as conditions allow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE

RATING TABLE--

PLASPLCO16 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

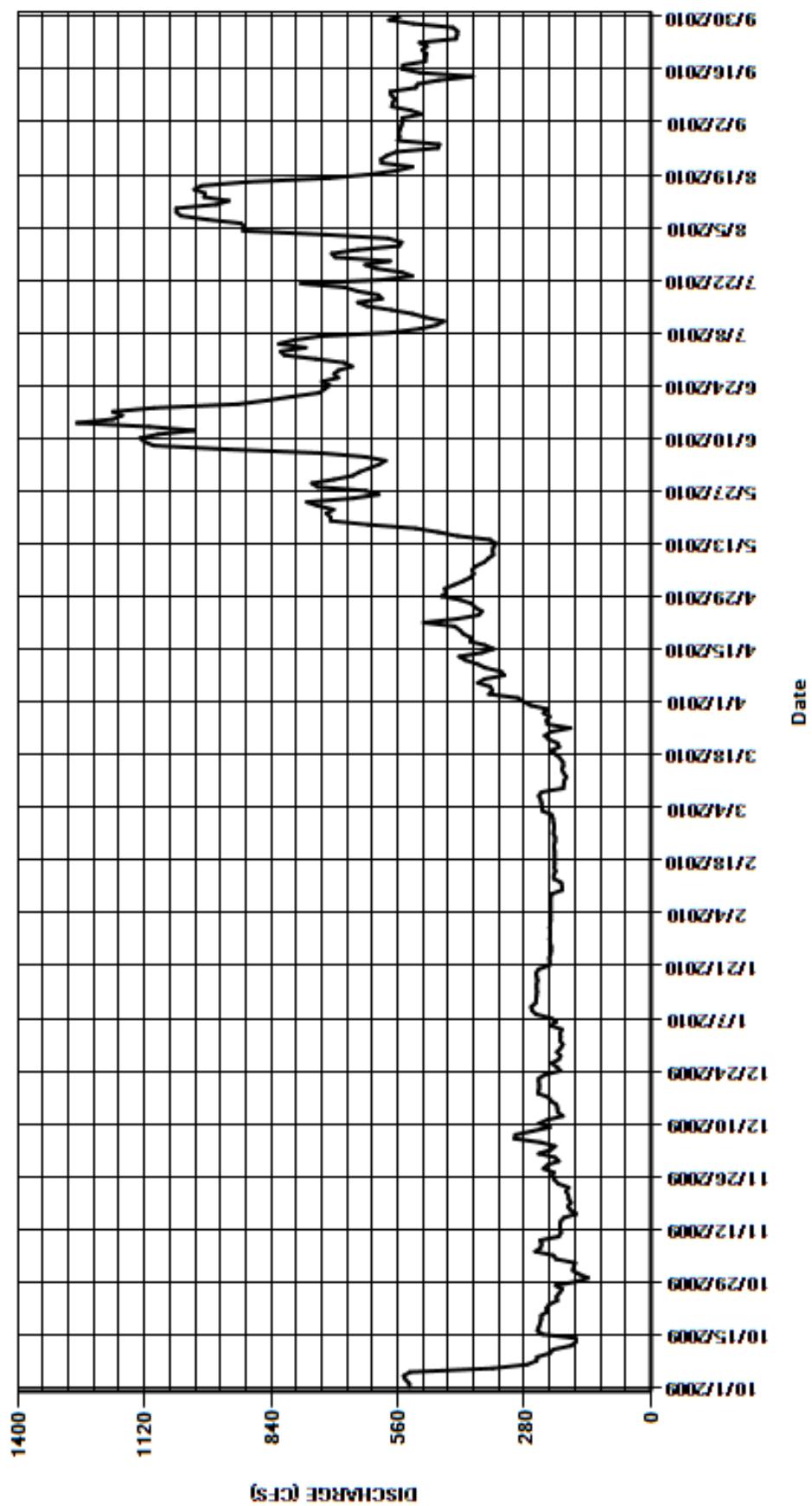
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	534	173	212	201	223	217	282	456	645	741	552	552
2	535	171	248	200	222	220	294	436	623	811	581	550
3	543	168	222	201	222	240	358	416	601	819	720	550
4	547	210	212	197	222	241	351	399	587	764	902	506
5	533	216	244	222	222	242	355	392	632	823	898	532
6	350	256	302	210	222	244	383	396	729	790	907	573
7	274	244	300	221	222	248	368	387	937	734	982	571
8	253	242	262	254	222	242	324	369	1100	574	1040	566
9	252	245	224	263	219	194	332	360	1120	511	1050	574
10	224	204	248	265	196	193	367	349	1130	474	1050	577
11	216	199	229	255	197	192	384	350	1090	458	961	520
12	177	201	195	254	199	187	410	349	1010	498	934	516
13	166	201	206	253	215	193	424	343	1110	528	988	469
14	166	200	207	252	215	197	374	356	1270	574	986	394
15	240	193	209	253	211	194	348	428	1190	628	1010	511
16	251	165	221	253	214	195	367	470	1170	648	994	550
17	248	178	227	251	213	201	400	520	1190	595	891	548
18	245	184	250	253	213	211	398	625	1100	603	712	499
19	243	177	248	254	213	221	415	708	913	649	620	499
20	243	182	247	248	213	203	423	709	849	677	562	496
21	230	183	248	225	214	207	434	718	794	774	527	506
22	231	188	248	224	214	226	503	702	734	595	596	495
23	225	182	234	225	212	235	428	737	722	528	597	512
24	207	205	200	222	212	221	381	761	711	551	584	431
25	209	213	208	221	216	178	374	659	728	607	563	429
26	203	218	220	221	215	229	389	602	692	632	471	428
27	196	215	204	223	214	231	396	631	701	577	468	438
28	211	238	200	224	216	224	421	737	691	698	560	525
29	166	229	208	223	---	238	463	750	661	706	556	579
30	139	204	200	223	---	228	452	701	679	648	558	555
31	159	---	195	224	---	266	---	660	---	557	555	---
TOTAL	8416	6084	7078	7215	6008	6758	11598	16476	26109	19772	23375	15451
MEAN	271	203	228	233	215	218	387	531	870	638	754	515
AC-FT	16690	12070	14040	14310	11920	13400	23000	32680	51790	39220	46360	30650
MAX	547	256	302	265	223	266	503	761	1270	823	1050	579
MIN	139	165	195	197	196	178	282	343	587	458	468	394
CAL YR	2009	TOTAL	159299	MEAN	436	MAX	1560	MIN	139	AC-FT	316000	
WTR YR	2010	TOTAL	154340	MEAN	423	MAX	1270	MIN	139	AC-FT	306100	

MAX DISCH: 1340 CFS AT 05:30 ON Jun. 14,2010 GH 4.38 FT. SHIFT 0.08 FT.

MAX GH: 4.38 FT. AT 05:30 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
Water Year 2010

Location.--	Lat. 39°26'00", Long. 105°07'30", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T.7 S., R.69 W., Douglas County, on right bank 1/4 mi downstream from Strontia Springs Dam.
Drainage and Period of Record.--	2596 sq mi. 1983 to present.
Equipment.--	Graphic water stage recorder, satellite monitoring data collection platform with digital shaft encoder installed in a formed concrete shelter. An adjustable reference point with a graduated tape on the float drive for the recorder is used for referencing. An adjustable reference for a drop tape is located below the floor hatch to the well. An outside staff gage is used as an additional reference. The gage and well are one-piece cast concrete, set on bedrock.
Hydrologic Conditions.--	The flow is controlled by reservoir releases most of the time, including flows released from further upstream at Cheeseman Reservoir and Robert's Tunnel. The flows will reflect extreme basin conditions when the reservoirs are very low or completely full. Strontia Dam is approximately 1500 feet upstream. The record usually runs in steps from the releases. A period of free river occurred in June this year during which Strontia gates were closed and the reservoir spilled all inflow.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with chart data used for backup. Record is complete and reliable, except for the following days when the inlets were partially plugged: April 2, 3; May 12; June 6-8. The encoder maintained calibration so that no corrections were necessary to the record.
Datum Corrections.--	In the past, it was believed that since the gage is cast on bedrock, no RP to BM checks were needed because the most stable BM sites would be all attached to the gage. Levels were first run on September 23, 2009. Three reference marks were established. No corrections were made.
Rating.--	The control is a boulder and cobble riffle channel. The grade drops approximately 170 feet below the gage (just below the cableway). The riffle below the cableway is considered to be the major control for flows under approximately 800 cfs. At flows above approximately 800 cfs the entire channel becomes the control. Rating No. 4, dated March 19, 2008 was continued for 2010. It is defined by measurements to 1670 cfs. Frequent measurements at high flows are needed since the channel does change, but additional measurements are particularly desirable around 1000 cfs, as computed flows in this range sometimes do not balance well with downstream gages. Twenty measurements (457-476) were made ranging in flow from 32.7 to 946 cfs. They cover the range in discharge except for lower daily flows on January 29 and February 5; and higher daily flows on June 13-15, 2010. The peak flow of 1010 cfs occurred at 1745 on June 13, 2010 at a gage height of 5.29 ft. with a shift of -.03 ft. It exceeded the stage of high measurement No.468 made June 13, 2010 by 0.08 ft.
Discharge.--	Shifting control method was used all year. Shifts at low and medium flows are caused by scour and fill through the section control below the gage. High flow shifts are influenced by downstream channel gradients and impedance factors. Measurements showed shifts ranging from -0.04 to +0.05 feet. Measurements 462, 467, 468, 470, and 475 were discounted 7%, 2%, -1%, 2% and -4% respectively to smooth shift distribution. Measurement 464 was discounted due to a follow-up measurement. Shifts were distributed by time with consideration of stage for the periods: October 1-March 31, and Sept 16-30. Shifts were distributed by stage using three variable stage shift relationships: March 31-April 30 (variable shift table 1 based on Msmts. 462-465, and high flow Msmts. 468, 469 and 472). April 30 was an event peak used for table transition. April 30-August 9 (variable shift table 2 based on Msmts 466-472, with Nos. 467, 470 and 472 being adjusted up to 2% to fit the table). August 9- September 16 (variable shift table 3, based on Msmts: 472-475, with No. 475 being adjusted 4% to fit the table).
Special Computations.--	Estimates for the days of partially plugged inlets were computed using known gate change times and the step-change pattern for releases. Strontia Springs Reservoir typically releases constant amounts for long periods of time and this helped to confirm the record. Also, the Strontia reports show max/min temperatures just below their Strontia Outflow numbers and this spares the need to examine the chart closely. The Caretakers at Strontia Springs Dam rely heavily on the correlation of electrical output of their generators to cfs values downstream.
Remarks.--	The record is considered good, exception for estimated days of April 2, 3, May 12, and June 8, which are considered fair; and June 6 and 7 which are poor. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	The Strontia—Chatfield gages need to be measured with the highest possible accuracy. Otherwise the shifts can cause bad water balances and lots of complaints. These gages need to be operated by very experienced personnel who are familiar with stage-shift relationships and the diversion flows that are balanced by the gage figures. The stilling well of this gage needs to be inspected for excessive sediment accumulation as there seems to be a sluggish reaction to gate changes of the Strontia Springs Dam. More frequent intake flushes also may be required to address the stilling-well response to changes in water levels. The description needs a photo showing the float tape and indicator as the primary reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS

RATING TABLE--

PLASTRC004 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	139	39	41	39	33	46	44	304	231	188	106	71
2	138	39	42	39	33	42	191	304	203	251	160	72
3	138	39	41	39	33	34	254	265	149	327	375	72
4	138	40	46	37	33	34	227	204	111	316	512	71
5	114	40	68	34	32	34	226	140	110	372	510	72
6	45	40	68	34	33	33	228	105	220	424	510	74
7	34	40	60	35	33	33	228	104	413	334	518	71
8	33	38	42	35	33	33	226	103	556	224	529	72
9	34	37	41	34	33	33	220	103	562	172	598	72
10	35	37	40	34	33	33	206	103	644	135	637	74
11	34	37	39	34	33	33	205	103	601	130	636	73
12	34	37	42	34	33	33	207	142	621	131	557	73
13	34	37	42	34	33	33	207	195	914	130	510	73
14	34	37	40	35	33	33	196	167	1000	123	485	72
15	35	37	40	34	33	33	174	211	981	119	462	72
16	37	37	40	33	33	33	164	254	851	122	463	74
17	37	36	41	33	33	33	164	350	804	122	431	51
18	36	36	38	33	33	33	163	429	641	122	333	41
19	36	37	39	33	33	33	162	494	492	122	186	40
20	36	37	40	33	33	33	161	446	428	154	142	46
21	37	38	39	34	33	32	160	386	361	283	143	46
22	37	40	40	33	33	34	162	373	318	357	127	44
23	37	40	39	34	39	35	197	374	287	220	128	92
24	38	39	40	34	46	35	263	434	236	137	112	113
25	38	39	40	34	46	37	169	392	204	130	91	113
26	38	39	40	34	46	37	199	258	204	129	79	140
27	38	39	40	33	46	36	264	182	203	146	75	154
28	39	40	39	33	46	36	268	245	274	158	75	150
29	38	41	39	32	---	35	270	316	300	143	75	151
30	38	40	39	33	---	36	289	293	251	116	76	151
31	38	---	39	33	---	37	---	251	---	105	74	---
TOTAL	1617	1152	1324	1063	994	1075	6094	8030	13170	5942	9715	2490
MEAN	52.2	38.4	42.7	34.3	35.5	34.7	203	259	439	192	313	83
AC-FT	3210	2280	2630	2110	1970	2130	12090	15930	26120	11790	19270	4940
MAX	139	41	68	39	46	46	289	494	1000	424	637	154
MIN	33	36	38	32	32	32	44	103	110	105	74	40

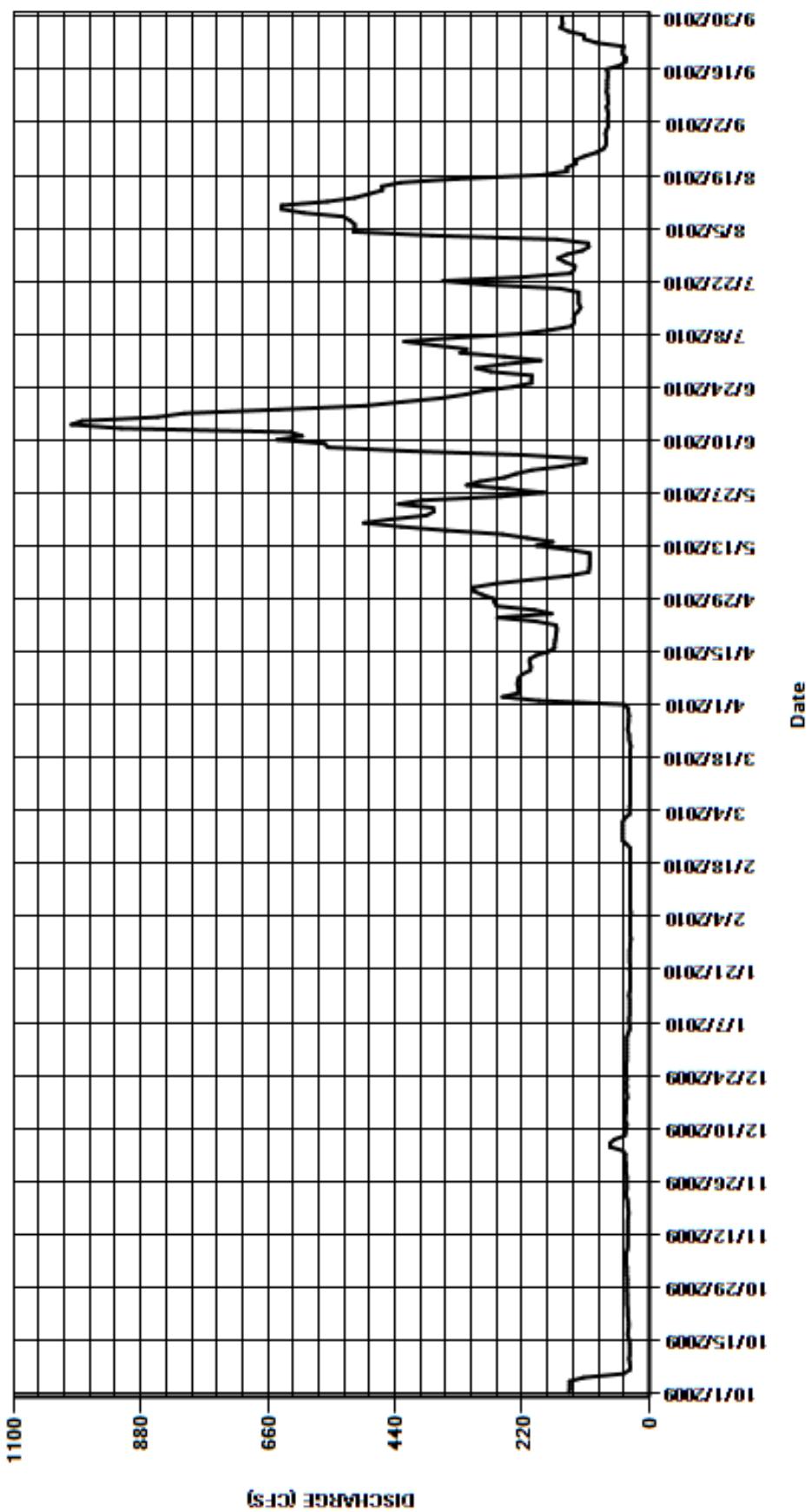
CAL YR	2009	TOTAL	75044	MEAN	206	MAX	1390	MIN	33	AC-FT	148800
WTR YR	2010	TOTAL	52666	MEAN	144	MAX	1000	MIN	32	AC-FT	104500

MAX DISCH: 1010 CFS AT 17:45 ON Jun. 13,2010 GH 5.29 FT. SHIFT -0.03 FT.

MAX GH: 5.29 FT. AT 17:45 ON Jun. 13,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06708000 SOUTH PLATTE RIVER AT WATERTON
Water Year 2010

Location.--	Lat. 39°29'18", Long. 105°05'32", in NE $\frac{1}{4}$ sec. 34, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002, on left bank 168 ft downstream from bridge on State Highway 221, 0.4 mi south of Waterton, 4.7 mi west of Louviers, and 6 mi upstream from Plum Creek.
Drainage and Period of Record.--	2,621 mi ² ; 1926 to present.
Equipment.--	Graphic stage recorder, and satellite monitoring DCP with a phone modem (on separate floats)-- in a 54-inch galvanized, corrugated steel shelter and well. The primary reference is an electric drop tape. The gage has power and is equipped with heat lamps to prevent the well from freezing. The DCP is state-owned, but the phone card is owned by the USACOE and maintained by the USGS. The gage is connected to the stream by 2 inlets with flush valves and risers. One of the risers is partially plugged. There is an outside gage that is no longer functional. A bank operated cableway for measuring high flows is located at the gage.
Hydrologic Conditions.--	A natural-flow hydrograph is not observed except during periods of extended high runoff when upstream reservoirs are all full. Flow is completely regulated at other times. Between Strontia Springs reservoir and the Waterton gage, Denver Water Department can divert water through Conduit 20, the Highline Canal and the Last Chance Ditch. The Last Chance diversion was new in the 2003 water year. In prior years Denver attempted to maintain a winter flow at Waterton of 30 cfs, but the use of the Last Chance diversion allows Denver's minimum streamflow at Waterton to drop to 15 cfs. This resulted in lower stream flows than have been historically seen at this gage. With the Last Chance ditch running, the FERC minimum streamflow is 15 cfs between September 16 and May 14, and 45 cfs between May 15 and September 15.
Gage-Height Record.--	The primary record is hourly averages of 15 minute data taken from satellite with chart back up. The record is complete and reliable, except for the following period of ice affect: December 4, 2009 to February 26, 2010. During December 6-16, the well was frozen. From October 29, 2009 to November 2, 2009 and for March 24, 2010: DCP data not available and backup chart record used without loss of accuracy. The crest of the control usually stays open, but the channel often freezes over. It is very hard to tell from inspection how much ice-effect is happening at the control. Also, periods when the inlets freeze can be tricky, since the release from Strontia Reservoir is usually constant in the winter. Visit notes, chart inspection, temperature data and the Denver Water Spreadsheets were used to determine ice effects. Without visit notes it is difficult to distinguish between ice effect at the gage and diurnal flow due to ice melting in the canyon. Also, ice affect can occur during a warm-up due to floating ice jamming on the control.
Datum Corrections.--	Levels were not run this year. Levels were last run to the inside gage on September 23, 2009, using R.M. No. 7 as base. At that time the benchmark elevations were re-established, and the gage was found to read correctly
Rating.--	The control is a broad crested weir formed by a pipeline crossing approximately 35 feet below the gage. Rating No. 10 developed for use in 2007 is defined from about 13 to 2000 cfs and was used this entire water year. Shifts, both positive and negative, are generally caused by scour and fill of channel material, vegetative growth, and detritus affecting the velocities of the control area and the channel as a whole. Twenty two measurements (Nos. 929-950) were made this water year ranging in discharge from 18.4 to 843 cfs. They cover the range in discharge experienced, except for lower daily flows of Feb. 7, Mar. 16-18, and the higher daily flows on June 13 and 16. The peak flow of 1280 cfs occurred at 1515 on June 16, 2010 at a gage height of 2.53 ft with a shift of -0.03 ft. It exceeded high measurement No. 941, made on June 14, by 0.44 feet in stage.
Discharge.--	Shifting control method was used. Shifts were caused by scour and fill of the approach area. This year's measurements show unadjusted shifts varying between -0.03 and 0.01 feet. Shifts were prorated by time with consideration of stage. Shifts do show a slight trend toward negative as stage increases, but the frequency and timing of measurements was such that time shifting was fully accurate. Stage consideration was used between measurements #936 (April 25) and #937. For purposes of ice estimation, the shift for the first Spring measurement, No. 931, March 12 was applied back through December. Msmt 945 was made with the bank-operated cableway for training purposes and was not used. Msmts 940, 943 and 950 were fair measurements and were adjusted up to 8% to fit distribution. Measurement 934 was made for training and adjusted 4% to match No. 933 made at the same time. Finally, Msmt. 937 was adjusted 3% to fit distribution.
Special Computations.--	Estimated flows during ice affected periods at the Waterton gage were developed from a mass balance spreadsheet. Discharges were used for South Platte River below Strontia Springs Reservoir, with columns subtracted for Denver's diversions to Conduit 20, the Last Chance Ditch, and the Highline Canal. (Denver's diversions were available on from their monthly "Chatfield Checksheets" accounting spreadsheets.) The mass balance estimate was found to be about 5 cfs higher than periods of good record, so this offset was incorporated into estimates. These spreadsheet should be used with caution of days of flow change, since Denver's accounting is based on 8am to 7am rather than calendar day figures like Strontia release and Waterton.
Remarks.--	The record is rated good, except December 4 to February 26 which is estimated and fair. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	The chart recorder should be watched closely. The channel and control should be cleared of ice during warm periods in the winter. Levels should be run in the 2011 and 2012 water years to verify the stability and elevation of RM 8.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06708000 SOUTH PLATTE RIVER AT WATERTON

RATING TABLE--

PLAWATCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

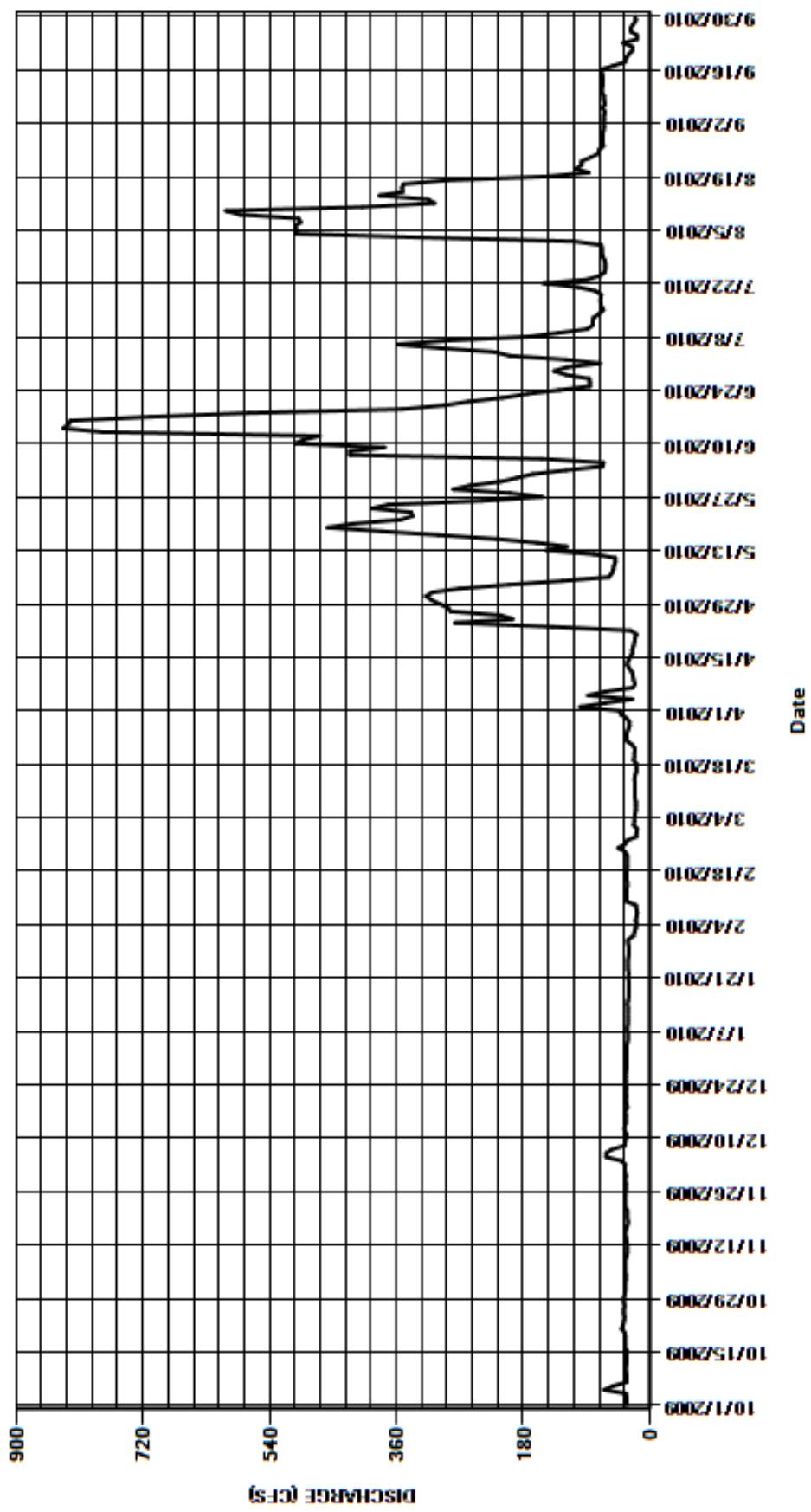
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	35	35	33	23	18	43	318	189	71	69	65
2	33	35	36	33	22	23	99	309	166	119	108	65
3	33	34	35	33	20	22	63	270	119	199	323	65
4	34	34	40	32	19	22	25	200	67	221	502	65
5	65	35	62	31	20	21	88	124	66	297	502	64
6	52	35	62	31	19	20	63	58	154	359	504	67
7	33	35	54	32	18	20	24	54	426	286	496	64
8	33	35	36	32	19	20	21	52	426	173	499	65
9	33	33	35	31	20	21	23	51	377	130	582	65
10	34	32	34	31	33	21	24	49	504	89	602	68
11	34	32	33	31	33	21	25	49	492	81	408	68
12	33	32	36	31	33	21	29	79	469	81	306	67
13	33	33	36	31	33	21	32	147	777	80	315	67
14	33	34	34	32	32	22	31	118	833	72	384	67
15	32	35	34	31	32	21	28	160	826	66	351	68
16	35	34	34	30	33	19	25	217	823	69	352	70
17	35	32	35	30	33	19	25	300	709	70	350	52
18	35	31	32	30	33	19	23	381	570	70	289	35
19	35	32	33	30	32	23	22	458	352	69	147	34
20	36	32	34	30	32	22	21	422	292	77	87	30
21	40	32	33	31	32	22	19	355	257	102	105	25
22	38	35	34	30	32	21	27	337	209	151	97	25
23	37	35	33	31	35	25	138	339	174	89	97	38
24	36	35	34	31	45	32	277	395	129	71	84	18
25	37	35	34	31	35	33	195	371	85	64	73	18
26	37	34	34	31	32	33	212	238	85	63	72	27
27	36	34	34	30	19	31	283	153	86	63	66	27
28	37	34	33	30	19	29	287	199	119	64	67	23
29	37	35	33	30	---	29	299	279	136	67	67	20
30	36	34	33	31	---	33	310	255	118	68	67	21
31	35	---	33	31	---	41	---	212	---	68	66	---
TOTAL	1130	1013	1138	962	788	745	2781	6949	10035	3549	8037	1453
MEAN	36.5	33.8	36.7	31	28.1	24	92.7	224	334	114	259	48.4
AC-FT	2240	2010	2260	1910	1560	1480	5520	13780	19900	7040	15940	2880
MAX	65	35	62	33	45	41	310	458	833	359	602	70
MIN	32	31	32	30	18	18	19	49	66	63	66	18

CAL YR	2009	TOTAL	51856	MEAN	142	MAX	1230	MIN	15	AC-FT	102900
WTR YR	2010	TOTAL	38580	MEAN	106	MAX	833	MIN	18	AC-FT	76520

MAX DISCH: 1280 CFS AT 15:15 ON Jun. 16,2010 GH 2.53 FT. SHIFT -0.03 FT.
 MAX GH: 2.53 FT. AT 15:15 ON Jun. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06708000 SOUTH PLATTE RIVER AT WATTERTON
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
Water Year 2010

Location.--	Lat. 39°33'45", Long. 105°03'35", SE ¼, sec. 1, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002.
Drainage and Period of Record.--	3,018 mi ² . 1985 to present.
Equipment.--	Graphic water stage recorder and satellite monitoring DCP with shaft encoder installed in a formed concrete well and shelter. An electric drop tape is used for referencing. There is no outside reference. A cableway is located at the gage. Satellite equipment is owned and maintained by CO DWR.
Hydrologic Conditions.--	Native flow is regulated by Chatfield Reservoir, as well as by many reservoirs further upstream. Releases from Chatfield during flood events are regulated to limit the total flow at the Henderson gage (downstream from Denver) to 5000 cfs. There are no minimum streamflow requirements for Chatfield releases. On many days the reservoir outlets are completely closed and flow at the gage consists of small amounts of seepage or gate leakage.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart back up. Daily max and min values agreed with the corrected chart values to within +0.02 foot. No encoder data corrections were applied. Record for March 23 and 24 were taken from the chart. The record is complete and reliable.
Datum Corrections.--	Levels were run on Sept. 23, 2009 using RM No. 1, and showed the new elevation of the RP to be 0.12 ft higher, at 20.09 ft, which was also the case for levels run July 26, 2006. No corrections were made, as shifts are correlating close to zero. Further investigation needs to be done to determine if the 20.09 ft reference elevation needs to be updated.
Rating.--	The control is a massive sloped concrete dam approximately 50 feet below the gage, with a deep stilling basin that is about 1000 ft. long back to the reservoir outlet pipe. This is a critical head measurement structure with a perfectly stilled pool at low flows. Anchor moss may grow at low flows, but this is easily removed. Measurement conditions near the gage are not good. The channel is very rocky and flow is deep and often extremely slow. The initial and subsequent ratings have incorporated a lot of scatter in the measurements. Variations in shifts at lower (wadeable) flows are probably more due to measurement error than to conditions affecting the control. If enough measurements are made with the highest possible precision, it should be possible to develop a table that does not require shifts, or measurements at lower flows. In fact, shift variations at low flows have at times made administration of the release problematic. Shift variations have been seen for high flow, cable measurements. Possible sources for this could be partial submergence of the control and growth of pond weed in the stilling basin. The extreme low end of the rating has not been verified in a long time. The PZF was observed to be 0.27 ft when the gage pool was drained and cleaned in November, 2007. Seepage flows (usually less than 0.5 cfs) are not measureable, and the near zero portions of the rating have been extensions to PZF from measurements in the 5 cfs range. Flows below 0.5 cfs should be considered estimates. Rating No. 3 was continued in use this year and is well defined to 2500 cfs. Eighteen measurements (No. 403-420) were made this year, ranging in discharge from 27.6 to 1570 cfs. These measurements contain the range in flow with exception of low flow days on Oct. 1-5, 8-12, 29-31, 2009; Nov. 1-30; Dec. 1, 2, 2009; Jan. 1-8; Feb 3-8; Mar 1-4, July 14-18; Sep. 2, 3, 5-9, 13-30, 2010. Measurement 413 captured the water year high flow day of April 27. The peak flow of 1580 cfs occurred at 1115 on April 27, 2010 at a gage height of 4.65 ft. with a shift of 0.03 ft. It exceeded measurement no. 413 (made the same day) by 0.01 ft in stage.
Discharge.--	Shifting control method was used all year. However, the control is a fairly massive structure and if kept clean of moss should have no source for shifting. The main source of shifts at this gage is very likely to be some degree of measurement error, combined with some degree of stage shifting. Big shifts have been seen at higher flows and are currently under investigation. This year's measurements show unadjusted shifts ranging from -0.07 ft to 0.03 ft. Shifts were distributed by time with consideration of stage for the periods: October 1, 2009 through April 21, 2010, using Msmts 403-412, which were given full weight, except pairs 408-409 and 411-412, which were adjusted up to 3%. The pairs were training measurements made at the same time and were adjusted so that a single shift was used for each pair. And, June 1-September 30, using Msmts 414-421, with Nos. 419 and 420 being adjusted 2% to smooth distribution. Shifts were distributed by stage using two variable stage shift relationships: PLACHACO10-1 based on Msmts 412-413, both given full weight, and applied April 21-27, 2010. This table defined the year's peak flow. And, PLACHACO10-2, based on Msmts 413-414, with No. 414 adjusted 2%, and applied April 27-June 1, 2010.
Special Computations.--	
Remarks.--	The record is good, except for seepage flows below 0.5 cfs which are estimated and poor. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	Pro-active measures should be taken with regard to shift variations at high flow. A staff should be installed below the control to check that high flow measurements are not encountering backwater. Cableway markings should be verified using a tagline at water level and a horizontal tape strung between the A-Frames. Vegetative growth in the stilling pool should be observed. Levels should be run to confirm elevations of the RM's and PZF, and reconcile any tape length problems. Finally, the flushing system should be operated at least once, to check the flush water supply plumbed in from the Last Chance Ditch pipeline.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

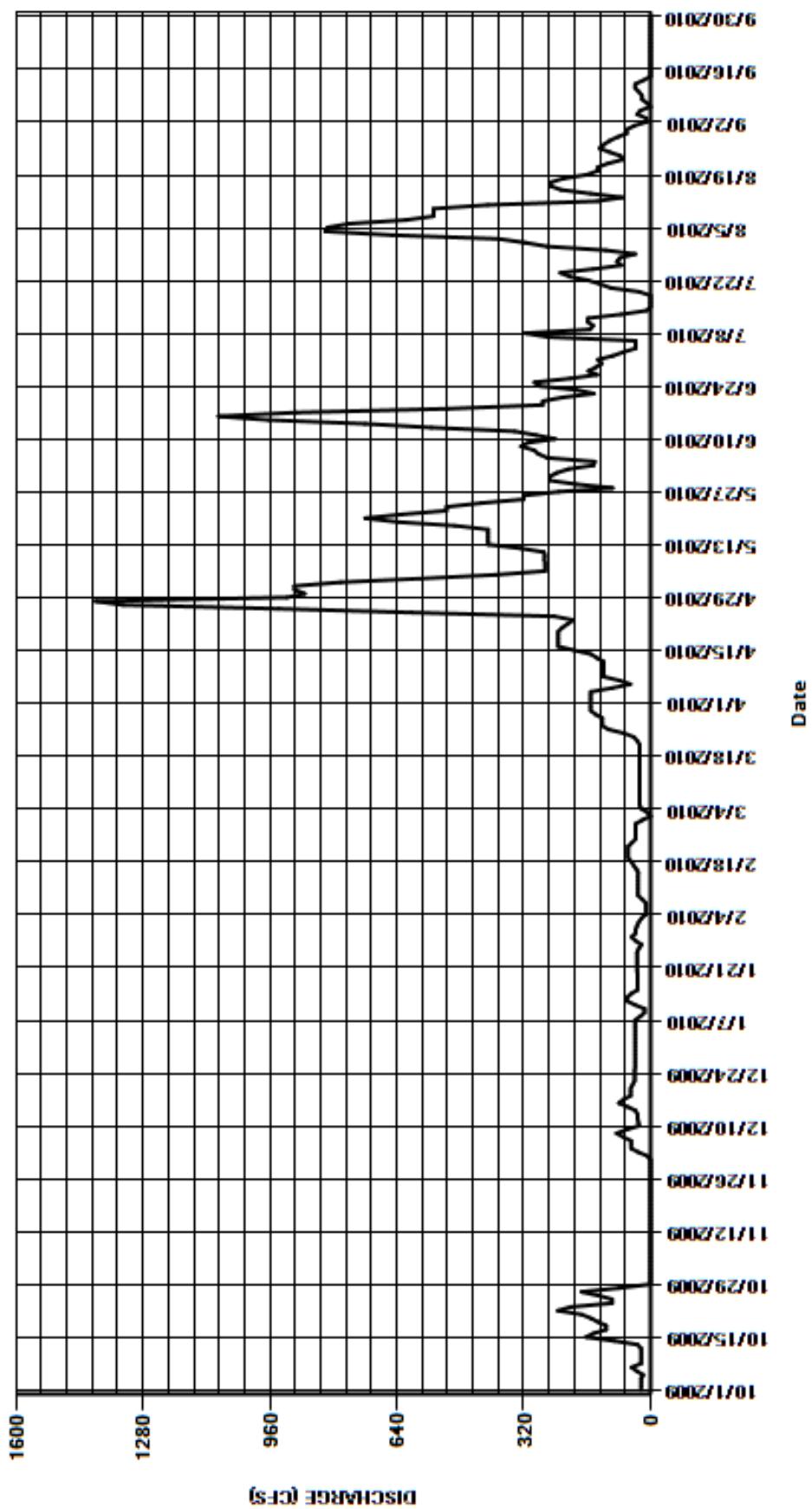
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	0.19	0.11	39	34	21	151	898	237	133	316	41
2	24	0.16	8.4	39	30	0.07	151	899	207	96	383	9.2
3	24	0.13	31	39	23	7.8	151	782	144	69	652	11
4	24	0.13	49	39	12	23	151	578	141	38	821	34
5	19	0.12	49	39	12	28	97	391	261	38	815	26
6	35	0.12	49	39	12	28	51	266	283	38	763	0.32
7	48	0.11	68	39	12	28	79	266	294	258	617	9.4
8	24	0.12	86	26	21	28	119	266	327	316	548	22
9	24	0.12	60	15	32	28	119	268	309	153	548	22
10	24	0.12	29	15	32	28	119	267	241	145	548	30
11	24	0.12	31	39	32	28	119	269	289	159	411	39
12	24	0.11	33	59	32	28	119	327	343	158	133	39
13	33	0.13	33	59	32	28	136	410	553	74	72	19
14	92	0.16	38	49	32	28	151	410	720	10	151	0.3
15	163	0.17	58	33	31	28	193	410	962	0.12	226	0.27
16	143	0.13	80	33	36	28	233	410	1090	0.09	252	0.26
17	112	0.13	68	33	43	28	233	410	893	0.11	252	0.25
18	112	0.13	50	33	49	28	233	493	511	0.11	220	0.25
19	132	0.13	50	33	57	28	233	639	272	29	161	0.26
20	151	0.13	50	34	57	28	233	720	272	100	134	0.26
21	174	0.13	45	34	57	28	223	628	222	127	133	0.28
22	234	0.13	40	34	57	34	209	515	143	157	107	0.27
23	201	0.13	40	34	47	42	195	515	188	204	71	0.29
24	97	0.13	40	34	38	67	244	427	280	228	76	0.26
25	97	0.12	40	34	38	106	602	320	293	145	104	0.26
26	131	0.12	39	30	38	122	938	320	203	74	129	0.27
27	174	0.11	39	23	38	122	1330	231	135	85	118	0.27
28	79	0.11	39	38	38	122	1400	96	157	77	104	0.25
29	0.32	0.11	39	48	---	139	917	189	138	39	83	0.25
30	0.26	0.11	39	38	---	151	873	255	123	113	60	0.25
31	0.25	---	39	38	---	151	---	255	---	261	60	---
TOTAL	2443.83	3.86	1359.51	1119	972	1583.87	10002	13130	10231	3324.43	9068	306.42
MEAN	78.8	0.13	43.9	36.1	34.7	51.1	333	424	341	107	293	10.2
AC-FT	4850	7.7	2700	2220	1930	3140	19840	26040	20290	6590	17990	608
MAX	234	0.19	86	59	57	151	1400	899	1090	316	821	41
MIN	0.25	0.11	0.11	15	12	0.07	51	96	123	0.09	60	0.25
CAL YR	2009	TOTAL	58303.12	MEAN	160	MAX	1870	MIN	0.1	AC-FT	115600	
WTR YR	2010	TOTAL	53543.92	MEAN	147	MAX	1400	MIN	0.07	AC-FT	106200	

MAX DISCH: 1580 CFS AT 11:15 ON Apr. 27,2010 GH 4.65 FT. SHIFT 0.03 FT.

MAX GH: 4.65 FT. AT 11:15 ON Apr. 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06710500 BEAR CREEK AT MORRISON
Water Year 2010

Location.--	Lat. 39°39'11", Long. 105°11'42, in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.4 S., R.70 W., Jefferson County, Hydrologic Unit 10190002, on left bank at Morrison, 180 ft upstream from bridge on State Highway 8 and 0.2 mi upstream from Mount Vernon Creek.
Drainage and Period of Record.--	164 mi ² . Sporadic, incomplete data Sep. 1881 to Feb. 1902. Good data October 1919 to current year. Monthly data for some periods only. Some early years published as near Morrison, at Starbuck, at Idledale.
Equipment.--	Graphic stage recorder and satellite monitoring DCP with telephone access in a 60-inch metal shelter and 48 inch well. The float for the encoder resides inside a cylinder tube containing Isopar (an anti-freezing agent). The back-up chart recorder is in the well itself and prone to freezing. A drop tape within the well referenced to an adjustable RP on the instrument shelf is the primary reference gage. There is no outside gage. Control is a compound weir. A bank-operated cableway at the gage is used for high flow measurements. No equipment changes were made this water year.
Hydrologic Conditions.--	The Bear Creek drainage is a mix of mountains and urban landscape. It extends from the mountains near Mt. Evans down to the City of Sheridan before entering the S. Platte River. In the summer of 2005, the Town of Morrison constructed a new bike path along the creek and past the gage. It does not seem to be affecting the gage or nearby creek banks in a negative manner.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite monitoring data with chart back up. Record is complete and reliable, except for the following periods: December 1, 2009–March 4, 2010, when the stage-discharge relationship was affected by ice and ice was observed in channel and in well. Missing data values were filled in using the chart on Oct 27 and Nov 29-Dec 1, when the DCP was missing transmissions, with no loss of accuracy. A correction of -0.08 ft. occurred on April 26, 2010 when debris was removed from the control. The correction was applied back to the gage height increase found on April 22.
Datum Corrections.--	Levels were last run in 2008. No corrections were made.
Rating.--	The control is a compound weir consisting of a broad crested concrete wall with a six-foot sharp-crested Cipolletti notch (one-foot deep) for low flows. Rating No. 23 was developed from the standard Cipolletti for the first foot and from measurements made in 2003 above the first foot. The rating shows a break in slope around 6.00 ft as flow goes above the notch and out over the much wider section of broad crested weir. Rating 23 is defined by measurements to 346 cfs, but it is not well defined around 6.00 ft where the flow transitions from the notch to the concrete weir. Fifteen Measurements (Nos. 989-1003), ranging in discharge from 11.5 to 138 cfs were made this year. The peak flow of 180 cfs occurred at 0730 on June 12, 2010 at a gage height of 6.99 ft with a shift of -0.03 ft. It exceeded measurement No. 996, made May 19, 2010 by 0.11 ft in stage.
Discharge.--	Shifting control method was used this year. Shifts are caused by scour and fill in weir pool and by ice-affect in the winter. Shifts generally have been negative at high and low stages and zero in the middle. Measurements show unadjusted shifts varying from -0.09 to 0.00 ft. Measurements 990 and 993 were adjusted 2%, and Measurement 1002, rated fair, was adjusted 7%. Shifts were distributed by time with consideration of stage for the entire water year.
Special Computations.--	Determination of ice affect involves some judgment, since the flow does fluctuate and peaks and bumps in the graphic record do not always mean ice. Also, flows in the winter are often less than 25 cfs, and as such are contained 100% within the Cipolletti notch. When flow is completely through the notch, measurement shifts often show little ice affect even if there is heavy ice in the gage pool behind the weir. Our general approach is to examine the graphic record and temperatures to identify periods of likely ice-affect. When the primary GH graph rises at night when the temperature is well below freezing, ice is usually indicated. Record can sometimes be estimated by chopping off ice peaks and correcting the GH. After editing any suspect GH's, we examine the computed discharges with temperature trends, and with figures from nearby USGS gages. If discharges rise when temperatures fall or if computed record is out of line with other gages, then some ice-affect is presumed. Estimates are made which are consistent with other gages, temperatures, and climate data. The -0.08 ft GH adjustment made for debris removal on April 26 was presumed to have occurred on a flow rise on April 22. The amount of uncertainty involved in this correction reduces the record to fair for this period. Light debris and branches accumulated at the weir between measurements during 4/22/2010 and 4/26/2010. Flow was estimated during December 1 – March 4, 2010 by reducing some GH's for ice affect and using computed record. Ice effect was possible throughout the period.
Remarks.--	The record is good except for the following periods: December 1, 2009 through March 4, 2010 is poor due to ice; and April 22-26 is fair due to debris on the control. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	A new rating table may be necessary for higher flows (i.e. flows above 200 cfs). A series of measurements should be focused around gage heights where flow transitions out of the Cipolletti weir notch in order to better define the rating. An outside gage has been installed but needs to be tied in with BM. Also, it would be a good idea to check the highway bridge for a MSL benchmark and tie the control BM back to sea level. Weekly measurements and ice observations with photos would help in evaluating how the ice affects the weir (if possible).

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06710500 BEAR CREEK AT MORRISON

RATING TABLE--

BCRMORCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

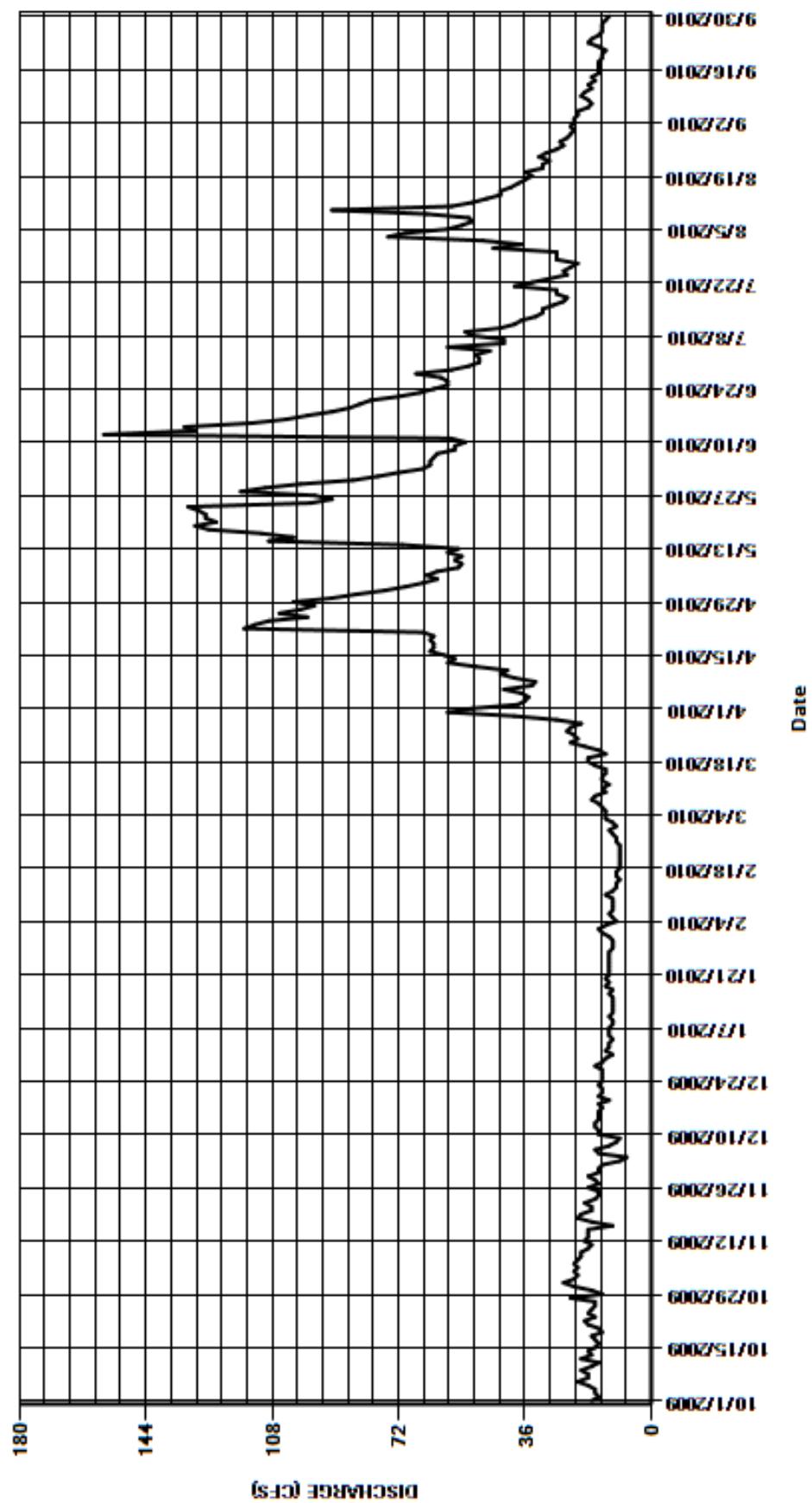
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	25	15	13	14	10	51	84	78	49	37	23
2	15	22	14	12	15	11	38	76	72	49	48	22
3	16	21	9	12	13	13	36	70	65	50	75	22
4	16	22	7	11	10	13	35	65	63	46	70	21
5	18	21	15	12	11	13	37	61	63	58	58	21
6	21	22	16	12	12	14	42	64	62	42	54	18
7	18	21	12	12	11	15	34	61	61	42	51	17
8	18	20	10	11	11	17	33	55	56	51	52	18
9	20	20	9	11	11	16	39	54	56	53	64	20
10	17	18	15	12	11	13	43	56	53	43	91	19
11	15	17	15	11	13	14	41	54	57	39	57	17
12	20	19	16	11	11	12	50	58	156	37	51	18
13	17	18	16	11	10	14	58	55	130	33	47	16
14	18	18	15	11	10	14	56	71	133	31	43	17
15	16	18	15	11	9	13	59	109	114	31	43	15
16	15	11	15	12	10	13	63	102	104	28	40	15
17	16	17	14	11	10	16	62	111	98	25	38	15
18	17	21	15	13	9	18	62	126	91	24	36	15
19	14	20	12	12	9	18	63	130	86	27	34	14
20	15	17	15	13	9	13	62	124	83	27	36	14
21	18	17	14	12	9	15	65	127	80	39	31	13
22	19	19	14	12	9	19	116	127	72	34	31	15
23	16	16	15	12	9	23	113	129	66	29	29	18
24	18	15	14	12	9	21	109	132	62	24	32	17
25	17	15	14	12	10	22	98	97	58	25	30	15
26	16	18	14	12	10	24	106	91	58	23	27	14
27	16	15	14	12	11	23	100	96	60	21	25	14
28	23	16	16	11	12	20	96	117	67	27	26	14
29	14	18	14	11	---	27	102	110	57	27	24	13
30	17	15	13	11	---	39	91	100	52	27	23	12
31	22	---	11	12	---	58	---	85	---	45	22	---
TOTAL	535	552	423.0	363	298.0	571	1960	2797	2313	1106	1325	502
MEAN	17.3	18.4	13.6	11.7	10.6	18.4	65.3	90.2	77.1	35.7	42.7	16.7
AC-FT	1060	1090	839	720	591	1130	3890	5550	4590	2190	2630	996
MAX	23	25	16	13	15	58	116	132	156	58	91	23
MIN	14	11	7	11	9	10	33	54	52	21	22	12
CAL YR	2009	TOTAL	11236.3	MEAN	30.8	MAX	136	MIN	7	AC-FT	22290	
WTR YR	2010	TOTAL	12745.0	MEAN	34.9	MAX	156	MIN	7	AC-FT	25280	

MAX DISCH: 180 CFS AT 07:30 ON Jun. 12,2010 GH 6.99 FT. SHIFT -0.03 FT.

MAX GH: 6.99 FT. AT 07:30 ON Jun. 12,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06710500 BEAR CREEK AT MORRISON
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06711500 BEAR CREEK AT SHERIDAN
Water Year 2010

Location.--	Lat. 39°39'08", Long. 105°01'57", in NW 1/4 NW 1/4 sec. 5, T.5 S., R.68 W., Arapahoe County, Hydrologic Unit 10190002 on left bank just downstream from bridge on South Lowell Blvd., at Highway Department maintenance building at northwest city limits of Sheridan, 1.3 mi upstream from mouth, and 2.1 mi west of city hall in Englewood.
Drainage and Period of Record.--	260 mi ² . April to Nov. 1914, March 1927 to current year. Monthly data only prior to Oct. 1933.
Equipment.--	A Sutron 8210 DCP with digital shaft encoder and phone (speech card) modem in a 42 inch corrugated metal shelter and well. Primary reference is an Electric Drop Tape (ETG). The wire weight gage was damaged by vandalism and has not been repaired. No outside readings were made during the 2010 water year. The DCP can be accessed by phone. A backup encoder was installed Dec 16, 2009 as no backup recorder was in place after removal of the A-35 recorder in WY09. The primary shaft encoder was replaced on Jan 6, 2010.
Hydrologic Conditions.--	Flows are controlled by releases from Bear Creek Lake, approximately 6 miles upstream. The land between the gage and the Lake is urban, and sharp peaks are observed as a result of storm runoff. The gage is directly affected by local precipitation since there are now two large storm culverts just upstream, another storm drain was added in July of this year which drains a local ball park south of the gaging station. A large shopping center is drained by the storm culvert on the north side of Bear Creek. The peak flow usually occurs as a sharp, short-duration storm event. Flow conditions are relatively steady year-round. The majority of flow represents a controlled release from Bear Creek Lake. This steady flow allows for reasonable assumptions to be made during periods of estimated record.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data from satellite. Record is complete and reliable for the entire year, except for the period of December 26, 2009 through January 6, 2010, when the shaft encoder failed and produced flat-line data; and the periods December 9 and 10, 2009, and February 23, 2010 when ice affected the stage discharge relationship. A gage height correction of +0.02 ft was made February 2, 2010. Corrections in gage height made as a result of cleaning debris off the control were applied as follows: April 7, 2010, -0.01 ft drop in GH occurred after removing a large log from the control. This was applied to March 31, 2010 where a sharp rise was observed in gage height where the log likely was deposited at the control. The inlets were flushed most visits in an attempt to keep the inlets clean and eliminate any flush corrections. A small flush correction of less than 0.01 ft was found on May 3, 2010, but not applied to the record.
Datum Corrections.--	Levels were last run on July 26, 2006. No corrections were made.
Rating.--	The control for all stages is a rock and concrete dam approximately ten feet below the gage with about 5 ft. of drop below it. Downstream conditions have never been observed to cause backwater at the gage. The dam has an uneven surface, with rebar sticking out in spots. Debris tends to accumulate at low flows, particularly in the fall when leaves are dropping. Rating No. 32, developed in 1998 was used for the present year. It is defined by measurements to 661 cfs. In past years the gage has experienced short peaks well above the rating, so the rating has been extrapolated to 3000 cfs. However, any flows above 1000 cfs need to be considered estimates and poor. Eighteen measurements (Nos. 972 - 989) were made this year ranging in discharge from 11.1 to 227 cfs. They cover the flow range experienced except for: April 23-30, May 15, September 11-22, 29 and 30, 2010. The peak flow of 599 cfs occurred at 1515 on April 23, 2010 at a gage height of 4.59 ft. with a shift of 0.00 ft. It exceeded measurement No. 982 (made on May 19, 2010), by 0.96 ft. in stage.
Discharge.--	Shifting control method was used all year. Shifts were caused by scour and fill of the approach pool and material passing over the control. Shifting probably has also been affected by the addition of gravel material introduced during the construction of the storm water culvert on the south side of the channel upstream of the gage. Shifts were distributed by time with consideration to stage for the entire water year. Measurements show shifts varying from -0.03 to + 0.01 ft. All measurements were given full weight except for Nos. 981, 984, and 989, which were adjusted up to 5% to smooth distribution. Measurement Nos. 979 and 980 were adjusted to the same shift as they were made during the same visit.
Special Computations.--	Flows were estimated during periods of ice affect on December 9-10, and February 23 using temperature data and adjacent good record. The period December 26 – January 6 was estimated due to missing encoder data. Flow was estimated by straight line interpretation between adjacent good record.
Remarks.--	The record is rated good, except for periods of ice effect and missing encoder data, which are estimated and considered fair. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	Continue visits every two weeks to ensure the control stays clear of debris, especially after rain events. If possible, extra visits should be made during extreme cold to break ice in the well. Light construction should be done to remove the catch points on the control to help with debris affecting gage height. Levels should be run as that has not been done since 2006. Pictures should also be taken of the interior of the gage since new equipment installation. Rating above 1000 cfs needs to be confirmed by slope-area or some other indirect method.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06711500 BEAR CREEK AT SHERIDAN

RATING TABLE--

BCRSHECO32 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	37	27	22	17	20	111	210	106	42	34	13
2	12	30	29	22	17	19	102	190	95	40	31	14
3	12	24	26	22	18	19	82	170	88	41	47	13
4	12	20	22	21	18	20	77	140	84	47	60	14
5	15	18	19	20	17	21	81	122	77	65	54	14
6	18	16	21	20	17	20	96	124	77	51	48	13
7	20	17	24	20	17	22	93	122	72	50	43	11
8	19	18	24	19	19	24	82	112	66	52	41	11
9	20	19	24	18	19	27	86	105	62	57	43	11
10	20	27	24	18	17	28	93	100	59	47	74	11
11	19	30	26	17	17	26	91	114	58	37	62	11
12	18	31	26	17	16	24	103	149	187	31	47	10
13	19	36	24	15	18	24	117	131	212	26	38	9.8
14	19	38	24	15	19	31	125	153	190	22	34	9.6
15	20	48	24	20	16	31	117	240	156	21	31	9.4
16	22	36	24	19	18	26	120	218	132	19	31	9.5
17	22	31	24	20	17	35	121	206	116	15	29	9.7
18	22	35	25	20	17	45	119	212	104	12	27	9.2
19	23	36	24	21	18	44	116	220	93	12	26	8.7
20	22	31	24	20	16	21	110	212	90	19	28	8.4
21	55	28	25	19	16	28	113	200	88	23	27	8.4
22	46	28	25	20	16	34	223	193	81	30	24	9
23	32	28	24	19	16	39	408	186	71	26	26	11
24	25	23	24	18	16	66	326	189	66	20	25	12
25	30	20	24	17	19	59	265	163	60	19	26	13
26	31	28	25	16	20	69	302	142	59	16	22	12
27	31	31	25	17	19	61	274	139	61	14	18	12
28	52	30	24	18	20	47	261	147	65	15	16	11
29	40	30	24	18	---	49	245	146	61	19	16	9.8
30	35	28	23	17	---	39	244	136	49	21	14	9.2
31	38	---	23	18	---	72	---	119	---	24	13	---
TOTAL	781	852	751	583	490	1090	4703	5010	2785	933	1055	327.7
MEAN	25.2	28.4	24.2	18.8	17.5	35.2	157	162	92.8	30.1	34	10.9
AC-FT	1550	1690	1490	1160	972	2160	9330	9940	5520	1850	2090	650
MAX	55	48	29	22	20	72	408	240	212	65	74	14
MIN	12	16	19	15	16	19	77	100	49	12	13	8.4

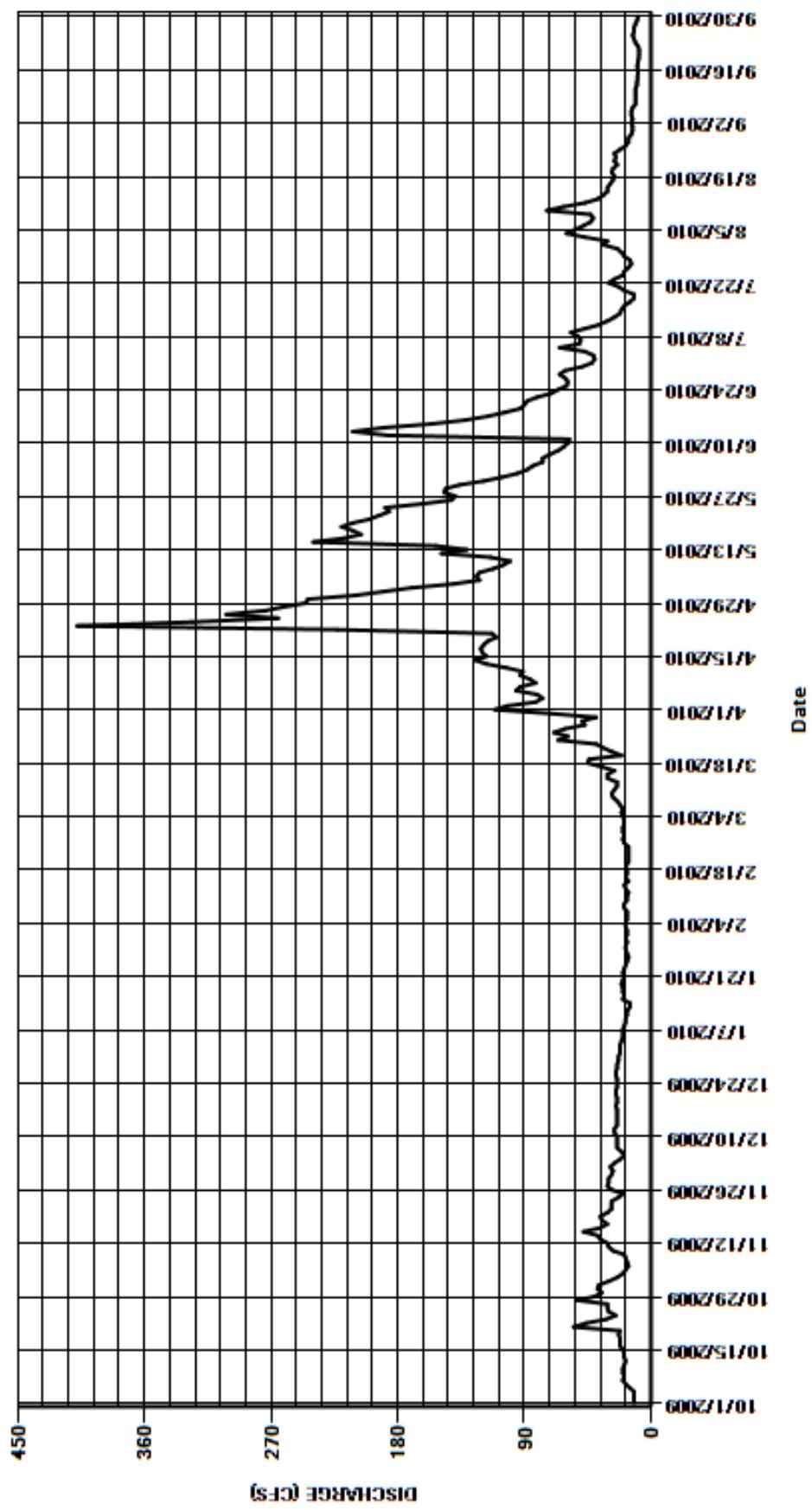
CAL YR	2009	TOTAL	15603.7	MEAN	42.7	MAX	362	MIN	5.5	AC-FT	30950
WTR YR	2010	TOTAL	19360.7	MEAN	53	MAX	408	MIN	8.4	AC-FT	38400

MAX DISCH: 599 CFS AT 15:15 ON Apr. 23,2010 GH 4.59 FT. SHIFT 0 FT.

MAX GH: 4.59 FT. AT 15:15 ON Apr. 23,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06711500 BEAR CREEK AT SHERIDAN
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06714000 SOUTH PLATTE RIVER AT DENVER
Water Year 2010

Location.--	Lat. 39°45'35", Long. 105°00'10", in NW 1/4 SE 1/4 sec. 28, T.3 S., R.68 W., Denver County, Hydrologic Unit 10190003, on right bank 90 ft upstream from Nineteenth Street Bridge in Denver and 0.4 mi downstream from Cherry Creek.
Drainage and Period of Record.--	3,861 mi ² . May 1889 to Oct. 1890 sporadic record. July 1895 to current year continuous. Monthly data only for some periods.
Equipment.--	Graphic water stage recorder, shaft encoder and Sutron 8210 high date rate DCP in a 72 inch by 72 inch precast concrete structure with a 48 inch corrugated steel well. Primary reference gage is an electric drop tape, with a supplemental outside wire weight gage. A city water line is plumbed to the gage for flushing the inlets. USACE is a cooperator on the gage, and UDFCD has Alert instrumentation installed. Additionally, the UDFCD contracts with the USGS to operate a water quality sampler there.
Hydrologic Conditions.--	
Gage-Height Record.--	The primary record is hourly averages of fifteen minute data taken from satellite monitoring with chart backup. Daily maximum and minimum stages for the satellite record checked to within 0.02 ft with the chart. The record is complete and reliable, except for the following periods: December 9-10, 2009, when the record appeared to be affected by ice; and, May 17-18, 2010, when the DCP failed and chart back up data were not available.
Datum Corrections.--	Levels were last run on September 24, 2009, but were inconclusive due to conflicting readings from RM 1 and RM 2. No correction was made at that time.
Rating.--	The control is a rock gabion dam approximately 50 feet below the gage. Rating No. 34 was begun in use on October 1, 2008. It is defined by measurements from 39.4 to 5340 cfs. Rating No. 34 was extended to 12,600 cfs using a peak flow on July 25, 1998 that was indirectly calculated using records from downstream gages. Eighteen measurements (Nos. 985-1002) ranging in discharge from 103 to 1120 cfs were made this year. A measurement of 1450 cfs was made during the high flow period but was not used. The peak flow of 6170 cfs occurred 1315 on April 23, 2010 at a gage height of 8.57 ft (gage height correction of -0.01 ft applied) with a shift of 0.00 ft. It exceeded Measurement 996, made on June 17, by 3.22 ft in stage. Peak flow at this gage usually defies measurement — often occurring as a sharp, transitory rise in the evening.
Discharge.--	Shifting control method was used all year. The channel has a sand bottom that is continually scouring and filling in the gage pool formed by the control, causing both positive and negative shifts. Measurements show unadjusted shifts varying between -0.14 to +0.04 feet. All measurements were given full weight, except No. 986, 989-991, 993, 994, 996, 1000 and 1001 which were adjusted up to 3% to smooth shift distribution. The highest measurement (No. 996) was adjusted 2%, and was considered poor. A large gage height change occurred during the measurement due to an interruption for a rescue operation. Shifts were prorated by time, considering movement of sand to be the primary shift mechanism. Unadjusted high flow measurements indicate possible negative shifting at higher stages, but reliability of the high measurements was not considered good enough to justify using stage-shift tables. Also, the rating is new, and time shifting puts the peak closer to the rating. Stage tables may be used in future years if other measurements support the trend hinted at in WY2010. In general, consideration to stage is given when time shifting at this gage, in order to give weight to effects of storm peaks. While no special shifting was done this year, each storm event was analyzed to verify that the peak flow had a shift that was consistent with any possible stage distribution.
Special Computations.--	The "spill", as added to some of the measurements in the past, is the regulating discharge from the Farmers and Gardeners Ditch. The spill is just upstream and across the channel from the gage. The ditch and associated Parshall flume are covered and buried, so the spill emerges from a culvert. Normally there is no place below the spill where a good measurement can be made, so upstream measurements are made with this "Spill" added to the total. There wasn't any spill during measurements this year, so none was added. It is impossible to actually measure the spill since it shoots out from under a gate and sluices down to the river. Velocities are supercritical and the flow has air in it. Often 10 cfs is estimated, based on a ditch rider statement that the head-gate will take a maximum of 35 cfs from the river and the ditch is decreed at 24 cfs. At low flow, this estimate can have a significant effect on measurement accuracy. Extreme low flow measurements have been made downstream of the Farmers and Gardeners Ditch spill and just upstream of the control pool. Normally this section is too deep to wade. Discharge for December 9-10 was estimated from adjacent non-ice affected record. Discharge for May 17-18 was estimated from good record trends before and after the period of missing data.
Remarks.--	The record is good, except for periods of ice effect and missing record, which are estimated and poor. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	Run levels in the spring of 2011 and summarize past observations in a levels summary spreadsheet.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06714000 SOUTH PLATTE RIVER AT DENVER

RATING TABLE--

PLADENCO34 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

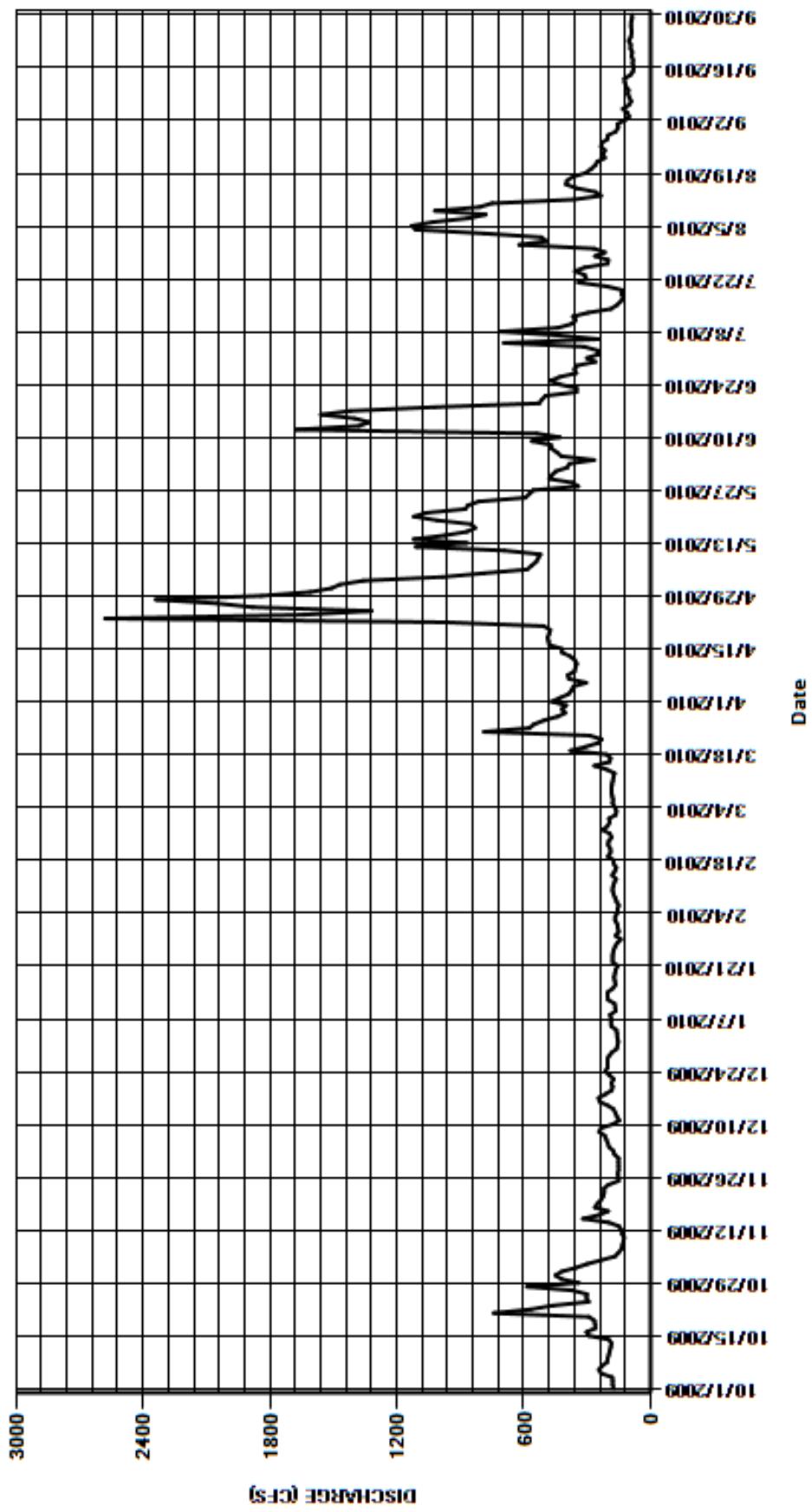
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	175	421	151	154	158	197	468	1510	449	301	494	156
2	180	354	171	158	168	165	428	1470	394	244	517	122
3	179	301	177	159	168	162	388	1360	385	251	787	102
4	182	235	197	162	158	169	374	983	267	315	1110	110
5	234	169	202	186	157	180	365	789	422	694	1130	132
6	245	152	210	187	151	178	304	584	443	247	1030	103
7	230	138	217	187	161	182	387	563	468	431	863	92
8	206	133	244	192	168	186	392	541	472	709	780	101
9	203	129	235	166	176	185	360	532	561	439	1020	108
10	198	125	180	168	180	183	356	521	429	376	809	105
11	193	135	148	171	178	179	350	692	539	354	749	117
12	189	138	159	202	172	176	359	1110	1680	367	360	122
13	185	150	167	203	164	171	381	868	1380	297	235	124
14	198	199	175	203	182	208	419	1120	1330	188	261	95
15	293	320	203	179	170	266	421	974	1400	160	351	83
16	303	243	242	166	163	194	480	869	1560	142	400	81
17	261	201	246	170	174	190	483	830	1420	129	396	85
18	263	264	214	173	177	208	487	849	1020	138	368	84
19	266	252	184	169	202	379	480	1010	527	135	308	90
20	292	235	180	165	190	309	475	1120	514	209	283	87
21	742	224	186	156	191	250	506	1060	497	342	263	95
22	566	220	174	180	201	231	967	877	350	305	253	94
23	462	221	195	179	199	289	2580	863	349	312	217	104
24	293	200	215	179	185	788	1640	813	430	358	226	94
25	304	152	204	176	193	573	1320	593	473	311	216	90
26	301	153	203	169	227	551	1880	574	429	203	235	91
27	369	155	205	159	204	505	2050	555	352	200	231	93
28	585	151	199	141	194	440	2340	343	361	263	204	92
29	340	152	184	166	---	404	1840	370	348	216	202	88
30	421	153	161	151	---	420	1610	480	261	268	165	88
31	451	---	156	155	---	399	---	467	---	622	154	---
TOTAL	9309	6075	5984	5331	5011	8917	24890	25290	19510	9526	14617	3028
MEAN	300	202	193	172	179	288	830	816	650	307	472	101
AC-FT	18460	12050	11870	10570	9940	17690	49370	50160	38700	18890	28990	6010
MAX	742	421	246	203	227	788	2580	1510	1680	709	1130	156
MIN	175	125	148	141	151	162	304	343	261	129	154	81
CAL YR	2009	TOTAL	146311	MEAN	401	MAX	2740	MIN	95	AC-FT	290200	
WTR YR	2010	TOTAL	137488	MEAN	377	MAX	2580	MIN	81	AC-FT	272700	

MAX DISCH: 6170 CFS AT 13:15 ON Apr. 23,2010 GH 8.57 FT. SHIFT 0 FT. (GH CORR. OF -0.01 FT APPLIED)

MAX GH: 8.57 FT. AT 13:15 ON Apr. 23,2010 (GH CORR. OF -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06714000 SOUTH PLATTE RIVER AT DENVER
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
Water Year 2010

Location.--	Lat 39°45'20", long 105°33'24", in SE1/4, Sec. 28, T.3 S., R.73W., Clear Creek County. Gage is located on right upstream bank of the I-70 box culvert, near the Fall River Road Exit (238) approximately 20 ft. past Fall River Road.
Drainage and Period of Record.--	Not determined. Gage established July 2007 at present site and datum to monitor minimum stream flow reach and aid in the administration of water rights.
Equipment.--	Sutron Satlink 2 Data Collection Platform (DCP) and Sutron AccuBubble unit in a 12-inch by 30-inch by 36-inch NEMA4 enclosure. A single orifice line in 2-inch conduit extends from the NEMA4 enclosure and terminates in a gravel packed muffler buried in the stream bed approximately 5-feet upstream from the steel sill plate/box culvert control. A staff gage located on the right edge of water is the primary reference with an additional staff gage located on the left edge of water wing wall of the culvert as backup (datum offset is applicable).
Hydrologic Conditions.--	Mountainous topography mainly consisting of densely treed slopes with sporadically patches of oak shrubs and grass. Rock outcropping increases with elevation and Saint Mary's Glacier sits at the headwater of Fall River. The river runs fast and quickly responds to rainfall-runoff events. Flow is partly regulated by several small reservoirs located upstream of the gage near St. Mary's Glacier. It should be noted that mining activity in this valley has occurred in the past.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered bubbler data with DCP logged data as backup. The record is complete and reliable, except for: November 17, 2009 to April 23, 2010, when the gage was disabled for winter and no gage-height record was collected. On June 12, 2010, an abnormal peak due to sudden backwater or an instrument problem was recorded, which did not fit with diurnal trends and there was no precipitation. For the period, July 15-23, 2010, the record is unstable due to a log on the control. The record "painted" for flows above about 30 cfs, due to hydraulic instability as flow bounced off the bridge wingwalls. Instrument calibration was supported by 16 visits to the gage. The instrument was set once in the spring and followed up with two calibrations throughout the summer. Accurate readings of the staff gage are subject to individual interpretation, duration of stage, and inconsistent and relentless bounce of the water surface. These conditions change frequently as a result of changing river bottom profiles. Lack of stable surface water conditions has affected gage calibration and the accuracy of staff gage measurements. The subjective interpretation of GH level varies widely with individuals and is compounded with increasing stage. Changes in stage also occur rapidly and unexpectedly with changes in environmental conditions upstream of the gage. Unstable surface conditions, previously reported as bounce, are easily seen in hydrographs of 15-minute data recordings. Two calibration corrections were made to the record: a +0.05 ft correction was applied from June 23, 2010 and distributed back to June 11, 2010; and a -0.02 ft correction was applied August 26, 2010 and distributed back to August 11, 2010. Removal of a log from the control on July 23, was cause for a -0.06 ft calibration between July 15 and July 23, 2010. However, this period was estimated based on adjacent measurement and record.
Datum Corrections.--	Levels were run August 10, 2010. The gage was found to be reading correctly.
Rating.--	The channel is composed primarily of gravel, cobble and small boulders. The control at all stages is a metal sill mounted in front of the box culvert running under I-70 about 5-feet downstream of the gage. Shifts result from material moving into the stilling basin, debris accumulation in the channel and from an incomplete definition of the rating. Cobble fills the weir basin entirely during runoff, so that the bed of the stream is level with the top of the weir. The channel alignment is straight above and below the gage. Rating No. 2, dated June 28, 2008, was used all year and is defined by measurements from 3.66 to 133 cfs. Rating 2 was extrapolated to 336 cfs (GH=2.70 ft) on June 14, 2010 to capture real time flows. Thirteen (Nos. 44-56) measurements were made this year, ranging from 4.12 to 133 cfs. These flows are generally higher than previous years of record. The peak discharge of 241 cfs occurred at 0945 on June 09, 2010 at a gage height of 2.36 feet with a shift of 0.07 feet. It exceeded measurement No. 48, 133 cfs made on June 11, 2010 by 0.41 feet of stage and 108 cfs respectively. The peak flow was 180% of the high measurement.
Discharge.--	Shifting control method was used all year. Measurements show shifts ranging from -0.19 feet to +0.11 feet. The wide range of shifting indicates changing stream bed profiles. Shifts were applied by time, with Msmt 50 being adjusted 4% for smoothing purposes. Consideration to stage was given during June 15-22, by extending the Msmt 49 (June 22) shift back through a period of steady GH to June 15. The large variation in shift between Msmts. 48 and 49 was contained in the interval June 11-15, where wide GH variability and suspected backwater occurred. Following June 12 a period of high shift variability [June 11 (+0.07), June 22 (-0.15)] occurred.
Special Computations.--	The flows during the period of July 15-23 when a log was in the control, were estimated from adjacent record and measurements, and are considered Poor. The log created unstable GH's and a high variability in shifts: July 14 (-0.15) to July 23 (+0.11).
Remarks.--	The record is fair except for the following days which are estimated and poor: June 12-14, 2010, due to instability in the channel and rating, and July 15-23, 2010 due to the effects of a log on the control. The instantaneous peak is of 241 cfs on June 9, 2010 is considered poor since it exceeds 150% of the highest measurement. Station maintained by Jana Ash and Tony Arnett and record developed by Tony Arnett.
Recommendations.--	Additional high flow measurements are needed with good stilling conditions for rating development. Photo of new control is needed for the station description. Cleanout of cobble filling in front of the control should be done when the gage is opened. Enlargement of the stilling area is planned for April, 2011. A structure upstream of the stilling pool for catchment of moving rock material would benefit maintenance of the gaging area and stabilization of flow conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.

RATING TABLE--

FALIDACO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	11	---	---	---	---	---	6.7	92	55	28	25
2	17	8.9	---	---	---	---	---	6.2	87	60	33	19
3	17	5.8	---	---	---	---	---	6.6	85	54	38	19
4	17	5.3	---	---	---	---	---	6.5	97	48	35	17
5	16	4.1	---	---	---	---	---	7.3	109	43	36	18
6	13	4.7	---	---	---	---	---	7.7	114	39	29	16
7	14	5.5	---	---	---	---	---	7.3	153	37	26	14
8	13	5.6	---	---	---	---	---	6.7	150	37	27	15
9	13	5.6	---	---	---	---	---	7.4	194	35	32	17
10	12	5.3	---	---	---	---	---	8.9	192	33	29	20
11	13	4.6	---	---	---	---	---	7.9	161	33	26	22
12	12	4.5	---	---	---	---	---	7.6	160	32	23	30
13	10	4.5	---	---	---	---	---	7	154	31	22	25
14	10	4.1	---	---	---	---	---	8.1	110	31	20	24
15	10	3.7	---	---	---	---	---	8.3	82	32	21	23
16	10	3.5	---	---	---	---	---	9.7	79	33	19	23
17	9.7	3.5	---	---	---	---	---	11	81	34	17	26
18	9.9	---	---	---	---	---	---	12	84	35	17	16
19	10	---	---	---	---	---	---	14	89	36	24	12
20	13	---	---	---	---	---	---	17	88	37	37	14
21	13	---	---	---	---	---	---	19	86	38	36	19
22	12	---	---	---	---	---	---	25	81	39	34	24
23	12	---	---	---	---	---	7	30	75	40	34	22
24	10	---	---	---	---	---	7.1	29	72	39	35	20
25	9	---	---	---	---	---	6.5	30	67	37	40	18
26	7.6	---	---	---	---	---	6.6	37	66	35	33	17
27	10	---	---	---	---	---	6.6	52	67	34	32	16
28	8.3	---	---	---	---	---	7.2	88	62	36	30	16
29	8	---	---	---	---	---	8.1	105	58	52	30	17
30	7.8	---	---	---	---	---	6.6	96	53	34	29	17
31	11	---	---	---	---	---	---	97	---	30	30	---
TOTAL	366.3	90.2	---	---	---	---	55.7	781.9	3048	1189	902	581
MEAN	11.8	5.31	---	---	---	---	6.96	25.2	102	38.4	29.1	19.4
AC-FT	727	179	---	---	---	---	110	1550	6050	2360	1790	1150
MAX	18	11	---	---	---	---	8.1	105	194	60	40	30
MIN	7.6	3.5	---	---	---	---	6.5	6.2	53	30	17	12

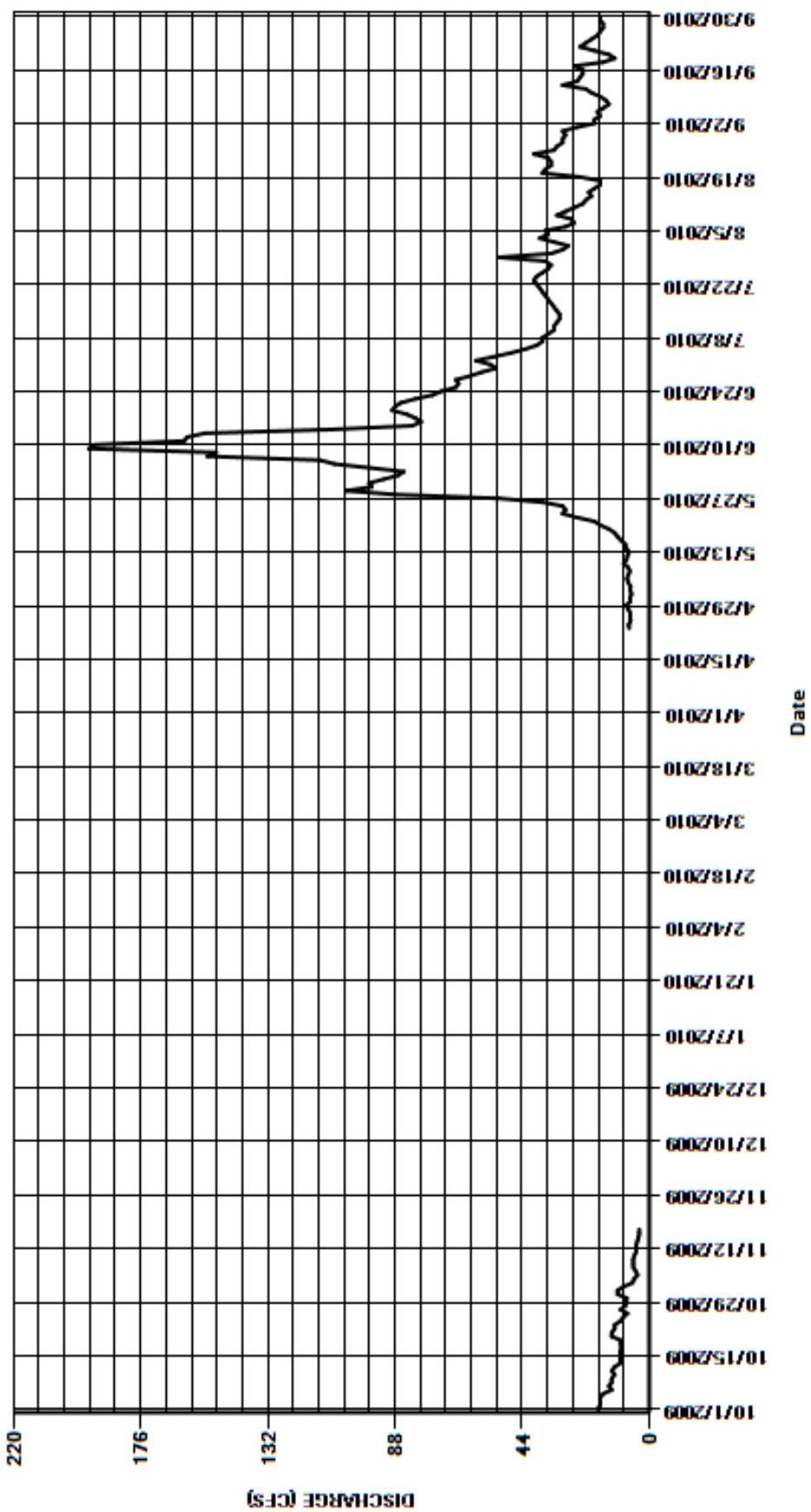
CAL YR	2009	TOTAL	5749.2	MEAN	29.5	MAX	95	MIN	3.5	AC-FT	11400	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	7014.1	MEAN	33.6	MAX	194	MIN	3.5	AC-FT	13910	(PARTIAL YEAR RECORD)

MAX DISCH: 241 CFS AT 19:45 ON Jun. 09,2010 GH 2.36 FT. SHIFT 0.07 FT.

MAX GH: 2.36 FT. AT 19:45 ON Jun. 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06720000 CLEAR CREEK AT DERBY
Water Year 2010

Location.--	Lat 39°49'42", long 104°57'30", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, T.2 S., R.68 W., Adams County, Hydrologic Unit 10190004, on right bank 875 ft downstream from York Street bridge, 0.5 mi upstream from mouth, and 2.5 mi west of Derby.
Drainage and Period of Record.--	575 mi ² . April-Nov. 1914, 1927 to present.
Equipment.--	Graphic water stage recorder and Sutron Satlink DCP with digital shaft encoder in a 60 inch corrugated metal shelter and well. The graphic stage recorder was replaced on Aug. 10, 2010 with a Sutron Stage Discharge Recorder (SDR). Primary reference is by electric tape gage (ETG). There is no outside reference. An external temperature sensor was installed on March 16, 2010. A tipping bucket rain gage is installed as well.
Hydrologic Conditions.--	Water is collected from the Clear Creek Drainage areas upstream and deposited ½ mile downstream into the South Platte River. Summer flows are affected by municipal and agricultural diversions upstream. In years of high snowpack, the runoff will exceed demand and much of the runoff will leave the basin past this gage. Gage also collects urban storm runoff and will see sharp peaks after rainstorms.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from the DCP with chart and SDR log as back-up. The record is complete and reliable, except for the following periods: December 4-8, 14-18, 23- 31, 2009, January 1-7, 14-16, 25-29, February 1-3, 6-11, 18-23, 2010, when the stage-discharge relationship was affected by ice; December 9-13, 2009; and January 8-13, 2010, when the stilling well was frozen. There were two periods where persistent instrumentation corrections were warranted but not immediately applied. It is suspected that the corrections stemmed from misunderstanding of a false sense of accuracy and precision displayed by the shaft encoder. The corrections were applied as defined by visits made to the gage during the two periods.
Datum Corrections.--	Levels were last run to the ETG using BM 10 as base on September 24, 2009 indicating a correction of -0.02 feet. The reference was not adjusted pending confirming results in subsequent years.
Rating.--	The control is a rock dam formed by a pipeline crossing approximately 25 feet below the gage. Shifts are caused by changes in the channel geometry, accumulation of material on the control and possible ice affect. Rating No. 34 put in use on October 1, 1998 was used again this year. It is well defined to 1500 cfs. Nineteen measurements (Nos. 961 - 979) were made this year ranging from 4.34 to 1210 cfs. They cover the range in discharge experienced this water year except for the higher daily flows on June 12-13, 2010. The peak flow of 2640 cfs occurred at 0345 on June 12, 2010 at a gage height of 4.16 ft with a shift of -0.07 ft. It exceeded measurement No. 972 by 1.01 feet of stage and 1430 cfs.
Discharge.--	Shifting control method was used for the record year. Shifts were distributed by time with consideration of stage: October 1, 2009–April 8, 2010 and August 20–September 30, 2010. Shifts were distributed by stage using three variable stage shift relationships: April 8–June 12, 2010 using CLERDERCOVST10-1 based on Measurements 968-972 made during the period; June 12–July 22, 2010 using CLERDERCOVST10-2 based on Measurements 971-975 made during the period; and July 22–August 20, 2010 using CLEDERCOVST10-3 based on Measurements 973-978 made during the period No. 971 made prior in the year.
Special Computations.--	Days affected by ice were estimated using adjacent good values, temperature trends, and some correlation to the PLAHENCO gage, downstream on the main stem of the South Platte River.
Remarks.--	The record is good, except for periods of ice affect and no gage height record, which are estimated and poor. Higher daily flow experienced on June 12, 2010, which included the peak for the year, exceeded 1.5 times the maximum measured discharge and is considered is fair. Station maintained by Jana Ash, Tony Arnett, and Patrick Tyler and record developed by Patrick Tyler and Russell Stroud.
Recommendations.--	A new rating is needed. The control is stable but needs regular cleaning to remove branches and debris. More measurements need to be made at intermediate and higher flows, especially in late Spring/early Summer when the peak normally occurs. Levels must be run in the 2011 water year. If the indicated correction to the ETG is verified it should be corrected. Increased observations and discharge measurements should be made during winter months. The discrepancy seen between the ETG and the shaft encoder should be investigated further and altered such that observations made in the field and collected data via the SMS system are consistent.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720000 CLEAR CREEK AT DERBY

RATING TABLE--

CLEDERCO34 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

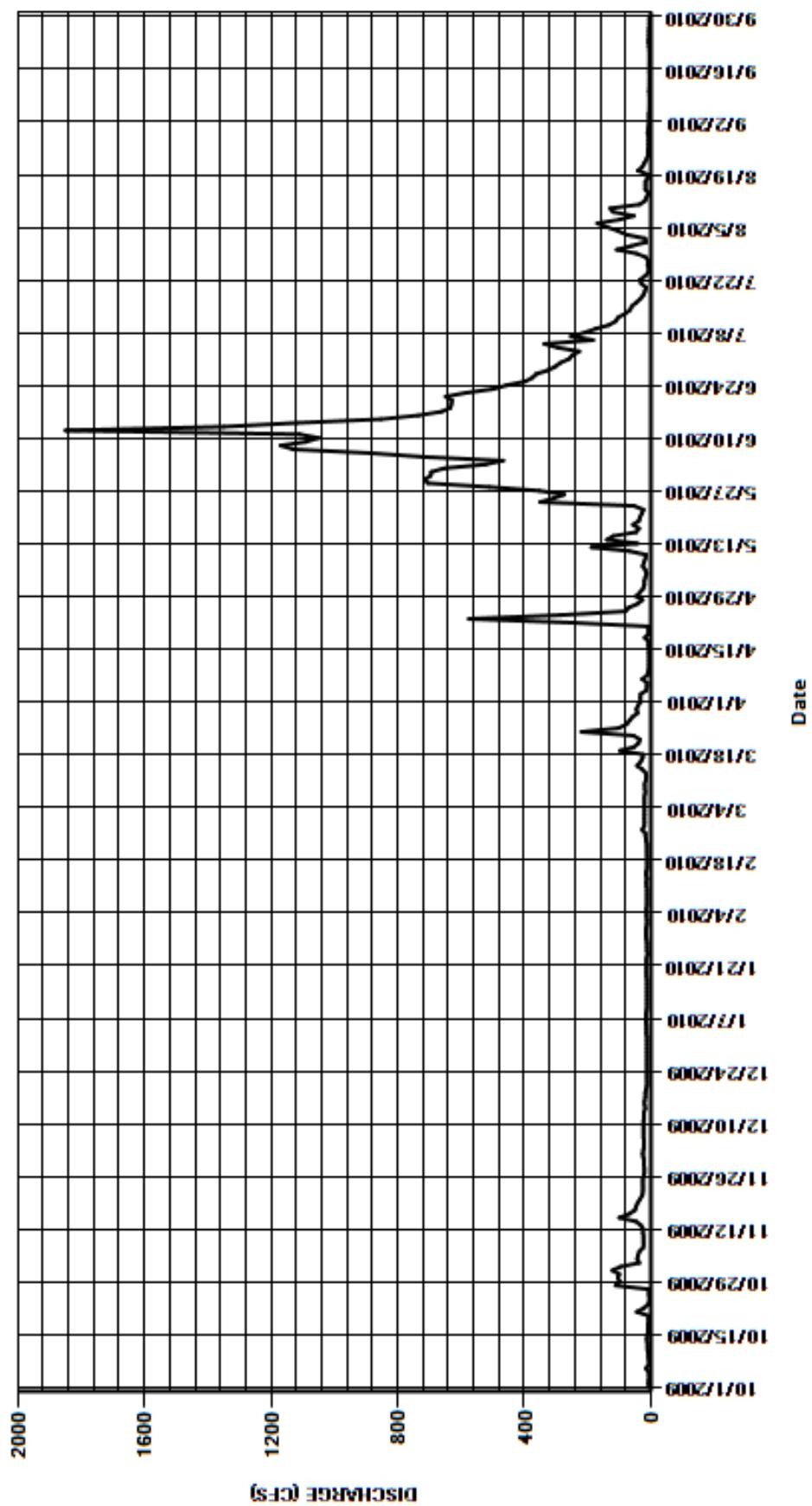
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.9	122	24	13	13	21	32	25	694	259	15	7.5
2	8.5	96	26	13	13	20	34	21	652	249	19	7
3	7.3	37	24	15	14	20	33	21	523	227	78	6.6
4	6.1	44	22	15	14	20	15	18	467	294	104	6.8
5	7.7	41	22	15	15	20	13	14	719	337	139	5.2
6	16	37	23	16	13	20	12	18	886	183	170	4.5
7	6.1	25	23	16	13	20	28	26	1130	253	99	4.1
8	7.1	23	23	16	13	18	12	22	1170	209	54	4.2
9	8.7	23	23	14	13	19	8.5	18	1090	175	119	5.1
10	9	24	23	13	13	20	6.7	15	1050	133	129	6.2
11	11	25	23	13	14	17	6.6	69	1110	112	36	5.2
12	11	25	22	13	15	15	6.2	188	1850	104	19	4.6
13	12	32	22	13	13	16	5.8	43	1350	82	14	4.5
14	13	47	18	13	16	27	7.5	139	1120	66	7.1	4.4
15	11	100	20	13	15	44	7.1	119	853	61	18	5.4
16	9.6	69	20	13	12	33	8	47	736	46	18	5.1
17	9.2	51	18	13	12	27	8.1	38	662	33	18	4.6
18	8.9	47	18	14	12	24	20	57	634	24	11	4.3
19	8.3	42	16	15	12	98	7.5	38	631	19	10	4.2
20	9	34	13	15	13	53	7.9	35	629	15	41	4.2
21	45	27	12	15	13	39	8.8	29	649	31	27	5.3
22	23	26	13	15	13	35	252	24	585	35	21	6.2
23	8.1	25	13	14	15	56	575	54	499	19	14	7.8
24	5.5	26	13	11	17	220	287	350	457	8.1	10	7.4
25	5.8	26	13	13	17	102	81	308	399	6.9	9.4	6.8
26	6.9	23	13	13	28	77	70	274	375	11	8.5	6.7
27	7.6	21	13	13	21	68	42	353	363	8.4	8.8	5.9
28	112	21	13	15	20	58	27	511	325	16	8.1	5.3
29	98	22	13	16	---	42	47	705	302	46	7.3	5.3
30	105	22	13	17	---	46	35	715	286	108	11	5.5
31	100	---	13	15	---	41	---	696	---	62	8	---
TOTAL	705.3	1183	565	438	412	1336	1703.7	4990	22196	3232.4	1251.2	165.9
MEAN	22.8	39.4	18.2	14.1	14.7	43.1	56.8	161	740	104	40.4	5.53
AC-FT	1400	2350	1120	869	817	2650	3380	9900	44030	6410	2480	329
MAX	112	122	26	17	28	220	575	715	1850	337	170	7.8
MIN	5.5	21	12	11	12	15	5.8	14	286	6.9	7.1	4.1
CAL YR	2009	TOTAL	49261.4	MEAN	135	MAX	1430	MIN	3.9	AC-FT	97710	
WTR YR	2010	TOTAL	38178.5	MEAN	105	MAX	1850	MIN	4.1	AC-FT	75730	

MAX DISCH: 2640 CFS AT 03:45 ON Jun. 12,2010 GH 4.16 FT. SHIFT -0.07 FT.

MAX GH: 4.16 FT. AT 03:45 ON Jun. 12,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720000 CLEAR CREEK AT DERBY
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06720500 SOUTH PLATTE RIVER AT HENDERSON
Water Year 2010

Location.--	Lat. 39°55'19", Long. 104°52'00", in SE 1/4 NE 1/4 sec. 34, T.I S., R,67 W., Adams County, Hydrologic Unit 10190003, on right bank 500 ft upstream from bridge on State Highway 22 and 0.2 mi northwest of Henderson.
Drainage and Period of Record.--	4,768 mi ² . May 1926 to current year. Monthly data only prior to 1933. Periodic water quality data available starting in 1955.
Equipment.--	Graphic water stage recorder and digital shaft encoder in 42-inch corrugated metal pipe shelter and well. Sutron 8210 DCP is housed in a 10 ft x 20 ft building approximately 10 ft upstream. The well shaft encoder connects to the DCP through conduit running between shelters. The recorder is set by and electric tape gage placed on the recorder shelf. A wire weight gage 1 foot downstream of well is used as a supplemental reference. The stilling well is connected to stream by three 2-inch intakes, each equipped with flushing provisions. One moveable flushing funnel serves one of the intakes. The other two intakes are flushed using an electric pump in the gage with a reservoir tank attached to the intakes. On September 16, 2009, a replacement test station was constructed on the left (opposite) bank using the same pool and control. The temporary station used a Sutron Constant Flow Bubbler with its own DCP. The test gage showed that the stilling well gage record was slow and distorted at times. A new permanent shelter and cantilever wire weight primary reference gage were completed on April 9, 2010 on the left bank in cooperation with a UDFCD bank stabilization project on that side. The new gage was temporarily named PLAHE2CO. It will act as a supplemental station for this water year and replace the old station in water year 2011. The supplemental data was most useful at low flows, since at higher flows the opposite bank gage showed higher readings than the old stilling well, particularly after the UDFCD channel work.
Hydrologic Conditions.--	Reservoirs and diversions above 64th Avenue (and Metro Wastewater) often totally control the flow to that point, leaving the Henderson gage to be strongly influenced by the Metro effluent and Clear Creek. Low flows exhibit a strong diurnal due to the Metro effluent. High snowpack in Clear Creek basin will usually signal snowmelt runoff periods at Henderson. Peak flows are usually seen from storm events. Rainstorm runoff from the metro area in the spring and summer will contribute sharp high peaks, often in the early morning hours. Under conditions of high basin-wide runoff, releases from Chatfield Reservoir upstream are regulated to keep the flow at or below 5,000 cfs at Henderson.
Gage-Height Record.--	The primary record is hourly averages of fifteen minute data taken from satellite monitoring with chart backup. The new gage on the opposite bank also provided a back-up for low water periods, but tended to record peak flows differently. The record is complete and reliable. Some interpretation was required for the following periods: December 23, 2009 through January 22, 2010, comparison with the new gage indicated that the gage inlets were clogging. Gage height values from the new station were used to replace this data. Calibration data for the new station is not available but no loss of accuracy is thought to occur since both gages agreed to 0.01 ft on December 22 and January 22. The inlets were extended on January 22. During March a coffer dam was in place on the left side of the channel while UDFCD re-sloped and rip-rapped the left bank. There were no measurements made during March, but photos on March 12 and 18 show no backwater effect at lower GH's. Comparison with discharges from upstream stations for peak events shows reasonable agreement for resultant total flow at Henderson. The shaft encoder remained in good calibration this year. Thirty-two visits were made to the gage this year ensuring instrument calibration. One 0.01 ft calibration adjustment was required this water year on May 5, 2010.
Datum Corrections.--	Levels were run on July 9, 2010. The tape was found to need a -0.04 foot correction, but this was not done due to the impending relocation of the gage.
Rating.--	The control is a grouted rock dam, established in 2002 as a grade control structure by the Urban Drainage and Flood Control District. The rock dam has a low flow notch in the right of center portion of the control, and will effectively regulate flow at all stages. The UDFCD also excavated the left side of the channel and pulled back and stabilized the left bank in March, 2010. Prior to the dam construction, the control was a shifting sand and gravel channel, with high flows influenced by the bridge opening approximately 500 feet downstream. The channel had been scouring during the entire history of the gage. The rock control raised the channel bed and PZF by about 2 ft. Rating Number 33, developed in WY 2004, was used for the entire water year. It is fairly well defined over a range of 55 to 7500 cfs. Twenty measurements (Nos. 569-588) were made this year, ranging in discharge from 142 to 3270 cfs. They cover the range of stage experienced except for the day of peak flow on April 23, 2010. Many measurements were performed using half counts (20 second counts instead of the full 40 seconds). This method is employed to counteract the large and rapid changes in stage due to Denver-Metro Sewer releases. The measurement section is getting difficult to wade as it narrows down and moves. This is suspected to be due to the frequently changing, and increasing number of sand bars building both upstream as well as downstream of the control. As the measurement section changes to accommodate a favorable section, lag times may become an issue to consider since changes in stage vary so greatly during short periods of time. Further use of weighted mean gage height computations may become necessary. The peak flow of 7270 cfs occurred at 1730 on April 23, 2010 at a gage height of 9.18 ft. with a shift of 0.00 ft. It exceeded the high measurement (No. 577) made on April 24th by 2.04 ft. in stage.
Discharge.--	The channel has a sand bottom and is continually scouring and filling. The channel work done in March this year by UDFCD would have contributed to movement of material through the control. Measurements show unadjusted shifts varying between -0.08 and +0.08 feet. Measurements 568, 576, and 584 were adjusted up to 8% due to large gage height changes that occurred during the measurements. Measurement 580 was adjusted 1% to zero out a high flow shift. Measurement 588 was adjusted 4% to show more water since moss may have affected meter operation. All adjustments worked to smooth shift distribution. Shifts were distributed by time proration for the entire year. Consideration to stage was given during the following periods: October 15-21, 2009, March 1-14, 14-24, 2010, June 23-July 4, 2010, July 4-5, 5-9 2010.

Special Computations.-- Due to rapid stage changes high flow measurement mean gage heights are usually computed using both discharge and time weighting. This is accomplished by inputting the Aquacalc section discharges and times into a spreadsheet containing gage height data and times. Wading measurements made some distance downstream may require use of time-delayed GH's. The lag time is estimated from the distance of the section downstream divided by the measurement mean velocity.

Remarks.-- Record is rated as good. Station maintained by Jana Ash and Patrick Tyler and record developed by Patrick Tyler.

Recommendations.-- Photos of the control at various high water stages would be helpful to determine the transition to channel control. These photos should be titled with the date and GH.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720500 SOUTH PLATTE RIVER AT HENDERSON

RATING TABLE--

PLAHENCO33 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

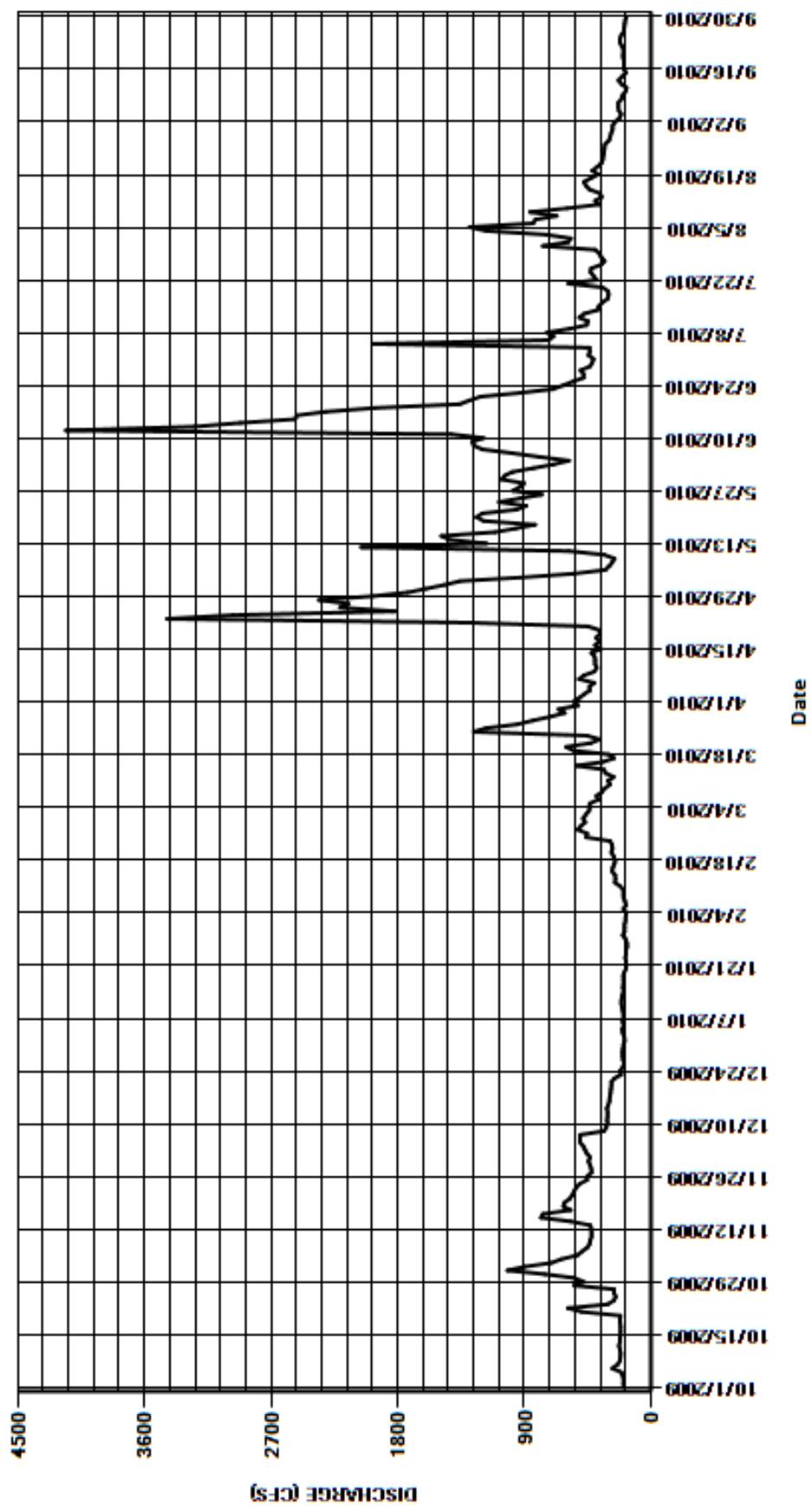
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	196	1020	432	187	187	483	549	1600	984	409	589	272
2	196	897	455	190	180	464	510	1470	837	444	569	255
3	194	709	469	200	180	441	476	1360	694	435	744	223
4	201	637	482	206	175	436	435	914	583	436	1170	212
5	212	524	504	193	197	435	439	547	792	1980	1290	229
6	275	492	503	202	177	374	402	324	989	727	838	232
7	238	455	503	197	185	387	512	297	1200	693	822	233
8	221	437	334	196	195	349	477	275	1260	740	671	210
9	218	432	318	201	197	329	402	260	1270	580	860	202
10	216	423	310	207	195	291	386	333	1190	457	596	181
11	221	424	312	212	220	306	397	584	1420	447	369	174
12	227	425	309	209	256	265	397	2060	4160	510	397	210
13	222	431	308	205	253	323	401	1170	3250	476	350	231
14	220	570	314	195	256	334	424	1430	2920	379	364	205
15	217	782	303	199	277	532	355	1490	2530	371	437	178
16	215	767	295	197	271	342	398	1110	2520	346	462	193
17	216	571	293	196	259	262	365	961	2310	308	478	194
18	219	623	288	198	256	300	391	824	1960	302	427	190
19	220	615	285	193	267	549	361	1190	1360	305	375	198
20	218	579	282	179	281	603	367	1240	1290	345	417	198
21	492	559	283	175	274	430	447	1200	1210	587	382	195
22	591	547	259	178	277	363	1300	956	928	386	353	206
23	308	532	213	182	291	457	3440	886	697	408	342	221
24	264	507	219	178	461	1260	2970	1080	622	429	339	220
25	251	454	199	178	454	1170	1820	928	553	427	333	211
26	262	453	190	171	520	950	2210	776	479	355	331	190
27	262	422	199	173	499	838	2150	982	479	330	327	190
28	547	425	203	181	468	716	2360	932	501	354	299	187
29	480	434	203	200	---	614	1980	902	434	368	290	183
30	547	445	199	188	---	657	1730	1060	418	397	283	174
31	756	---	195	187	---	519	---	1040	---	769	272	---
TOTAL	9122	16591	9661	5953	7708	15779	28851	30181	39840	15500	15776	6197
MEAN	294	553	312	192	275	509	962	974	1328	500	509	207
AC-FT	18090	32910	19160	11810	15290	31300	57230	59860	79020	30740	31290	12290
MAX	756	1020	504	212	520	1260	3440	2060	4160	1980	1290	272
MIN	194	422	190	171	175	262	355	260	418	302	272	174
CAL YR	2009	TOTAL	212386	MEAN	582	MAX	4790	MIN	142	AC-FT	421300	
WTR YR	2010	TOTAL	201159	MEAN	551	MAX	4160	MIN	171	AC-FT	399000	

MAX DISCH: 7270 CFS AT 17:30 ON Apr. 23,2010 GH 9.18 FT. SHIFT 0 FT.

MAX GH: 9.18 FT. AT 17:30 ON Apr. 23,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720500 SOUTH PLATTE RIVER AT HENDERSON
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
Water Year 2010

Location.--	Lat. 40 07' 55", Long. 105 31' 00", NE1/4 NW1/4 Sec. 24, T.2 N., R.73 W.
Drainage and Period of Record.--	Gage established on May 14, 1998 by State of Colorado, Division of Water Resources personnel. This gage will be a partial year record station.
Equipment.--	Graphical water stage recorder, Sutron shaft encoder and Sutron Satlink 2 Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter and 42-inch steel stilling well. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrologic Conditions.--	Drainage area is comprised wholly of uninhabited forested lands with varying topography. Gage is located in the Indian Peak Wilderness Area of Roosevelt National Forest, at the Peaceful Valley / Camp Dick United States Forest Service campground facilities. No known diversions occur upstream from the gage. Marked diurnal flow occurs during peak snowmelt months. Due to heavy winter conditions and the remoteness of this gage, year-round operation of the gage is not possible.
Gage-Height Record.--	The primary record is hourly averages of 15-minute transmitted data with graphical chart record as backup. The record is complete and reliable, except for the following periods: October 10-11, 28-31, November 14-17, 2009 when the gage was affected by ice; November 19, 2009 to May 14, 2010 when the gage was off for winter (Telemetry was turned on May 4, but the inlet side of the well was frozen. The well was completely thawed on May 25. Good record was presumed to begin on May 15 when a diurnal was seen); June 4-7 when GH was affected by drawdown issues. The drawdown problem was noted at 1100 June 7 and fixed at that time by trenching a channel to the gage and opening up the inlet flushing tee. A large correction (+0.29 ft.) resulted. The period of bad record was defined by good GH on the June 2 measurement, and by noting that the GH began fluctuating abnormally on June 4. Flush corrections were noted when the trench was cleaned on May 20, June 16 and 25, and July 8. A few hourly GH's were adjusted on each of these days without loss of accuracy.
Datum Corrections.--	Levels were run on October 14, 2009. The RP was discovered to be an average of -0.014 ft. low in elevation. As this is within the 0.02 ft. allowable tolerance, no correction was made.
Rating.--	The control for low to moderate stages is a rock riffle composed of embedded cobble and boulders approximately 15 feet downstream of the gage. The high water control is a sharp bend and gradient change in the stream channel approximately 40-feet downstream of the gage. The low to moderate control is subject to shifting boulders moving in to and out of the control area as well as material embedding and being released from the rock riffle. Rating No. 4 in use since October 1, 2004 was continued this year. Rating No. 4 is defined by measurements from 4.6 to 339 cfs. Thirteen discharge measurements (Nos. 99-111) were performed this year ranging in discharge from 4.54 to 339 cfs. Measurements made this water year cover the range in stage except for June 7 - 8, 2010, where mean daily flow exceeded that of the high water measurement. Measurement 104 (339 cfs) made this year is the highest measurement made at this station. No. 104 is considered very reliable, since an undocumented check measurement was made immediately, and showed the same discharge. The peak flow of 548 cfs occurred at 2000 June 7, 2010 at a gage height of 3.73 ft with a shift of -0.24 ft. It exceeded measurement No. 104 made on June 8, 2010 by 0.30 feet of stage and 210 cfs.
Discharge.--	Shifting control method was used all year. Moss and debris accumulation is not an issue at this gage; however fill and scour conditions as well as control movement does occur. Over the last few years the deterioration of the control has created a draw-down problem in the well. Several occurrences of drawdown can be seen in the record. Additionally, boulders comprising the control are subject to becoming lodged or dislodged during runoff events. Unadjusted shifts ranged from -0.02 to -0.24 feet. Measurement No. 103 had an unreliable GH due to drawdown problems. The shift for No. 103 was not used, but the discharge measured was used to help estimate flow for the day. All shifts were given full weight, except No. 107 which was adjusted 3% to better fit distribution. Shifts were applied by time proration for the periods Oct. 1—Nov. 19, 2009, and July 16—September 30, 2010. Shifts were distributed by stage for the period May 15—July 16, 2010 using variable stage-shift relationship MIDSTECOVST01 based on Measurements 101-105 made during the period and No. 100 made prior.
Special Computations.--	Discharges were estimated for ice affected days using surrounding good record and temperature trends. Discharges for drawdown affected days were estimated as follows: June 4, computed record; June 5-6 interpolation to adjacent record; June 7, partial record and discharge from measurement No. 103. The peak gage height recorded on June 7, 2010 is considered reliable since the drawdown was fixed earlier that day. However, the discharge exceeds 150% of the highest measurement on record (made the next day). So the peak is considered poor.
Remarks.--	The record is good except periods of ice effect and drawdown effect, which are estimated and poor. The instantaneous peak flow of 546 cfs for the year is poor due to lack of rating definition. This is a partial year record. No discharge record is kept for the winter period (November 19, 2009 to May 14, 2010). Station maintained and record developed by Patrick Tyler.
Recommendations.--	Efforts should be taken to better define the upper end of the rating as conditions allow. Peak diurnal stages and higher flow rates occur in late May to early June around 2200 to 2400 each day, are short in duration, and make this difficult. A new control was constructed on November 6, 2010 at the same location. At the opening of the station in the spring, a new rating will be developed. The new control creates a stilling pool which should eliminate any drawdown conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY

RATING TABLE-- MIDSTECO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7	6.2	---	---	---	---	---	---	175	105	39	13
2	7.4	6	---	---	---	---	---	---	159	123	52	13
3	7.4	5.3	---	---	---	---	---	---	164	111	81	12
4	7.2	5	---	---	---	---	---	---	220	96	80	11
5	7.7	5.1	---	---	---	---	---	---	270	78	58	11
6	7	5.2	---	---	---	---	---	---	320	68	46	11
7	7	5.2	---	---	---	---	---	---	365	69	40	10
8	7.2	5.1	---	---	---	---	---	---	368	77	38	9.7
9	6.7	4.6	---	---	---	---	---	---	309	70	34	11
10	6.5	4.5	---	---	---	---	---	---	288	63	29	9.7
11	6.5	4.3	---	---	---	---	---	---	243	61	27	8.8
12	6.4	4.4	---	---	---	---	---	---	303	61	27	8
13	6.3	4.4	---	---	---	---	---	---	220	66	25	7.6
14	8.4	5	---	---	---	---	---	---	155	66	23	7.7
15	8.6	5	---	---	---	---	---	9.3	118	59	22	7.8
16	6.7	5	---	---	---	---	---	11	138	50	23	7.8
17	6.1	5	---	---	---	---	---	17	147	45	22	7.7
18	6.1	4.6	---	---	---	---	---	25	142	43	21	7.6
19	6.5	4	---	---	---	---	---	33	159	42	23	7.4
20	6.5	---	---	---	---	---	---	39	149	41	26	7.3
21	6.7	---	---	---	---	---	---	54	119	44	23	7.5
22	5.9	---	---	---	---	---	---	66	115	47	22	7.8
23	6.1	---	---	---	---	---	---	84	110	45	23	8.1
24	5.6	---	---	---	---	---	---	88	118	41	22	7.1
25	5.6	---	---	---	---	---	---	73	117	40	21	6.4
26	5.4	---	---	---	---	---	---	86	136	37	19	6.4
27	6.5	---	---	---	---	---	---	110	121	34	18	6.5
28	7	---	---	---	---	---	---	153	107	35	18	6.6
29	7	---	---	---	---	---	---	196	100	42	17	6.5
30	7	---	---	---	---	---	---	196	103	44	16	6.6
31	7	---	---	---	---	---	---	181	---	41	14	---
TOTAL	209.0	93.9	---	---	---	---	---	1421.3	5558	1844	949	258.6
MEAN	6.74	4.94	---	---	---	---	---	83.6	185	59.5	30.6	8.62
AC-FT	415	186	---	---	---	---	---	2820	11020	3660	1880	513
MAX	8.6	6.2	---	---	---	---	---	196	368	123	81	13
MIN	5.4	4	---	---	---	---	---	9.3	100	34	14	6.4

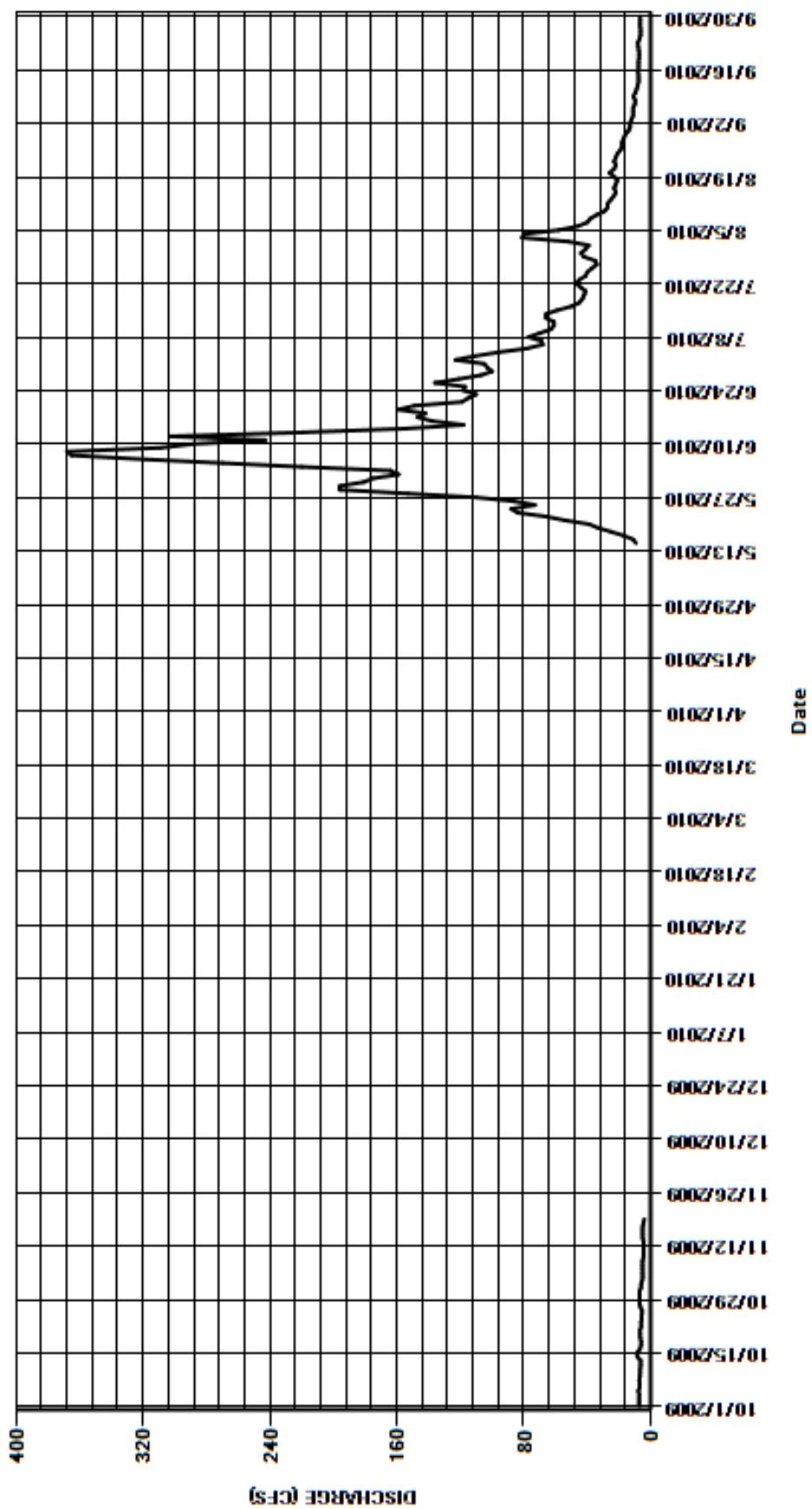
CAL YR	2009	TOTAL	11087.6	MEAN	57.4	MAX	275	MIN	4	AC-FT	21990	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	10333.8	MEAN	54.7	MAX	368	MIN	4	AC-FT	20500	(PARTIAL YEAR RECORD)

MAX DISCH: 548 CFS AT 20:00 ON Jun. 07,2010 GH 3.73 FT. SHIFT -0.24 FT.

MAX GH: 3.73 FT. AT 20:00 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06722500 SOUTH SAINT VRAIN NEAR WARD
Water Year 2010

Location.--	Lat. 40°05'27", Long. 105°30'50"
Drainage and Period of Record.--	14.4 mi ² ; 1925-27, 28-31, 54-73, 1992 to present.
Equipment.--	Graphical water-stage recorder, shaft encoder connected to a Sutron Satlink data collection platform (DCP) in a 42-inch diameter corrugated metal pipe shelter and well. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrologic Conditions.--	Drainage area is virtually uninhabited forested lands up to the continental divide, with no artificial diversions. This site is commonly used for watershed studies. The gage is approximately 3.5 miles downstream from Brainard Lake, a naturally occurring water body. Water passing this gage is diverted into the Lefthand Creek basin about 1/3 mile downstream, at the Lefthand Ditch Diversion (LEFTHDCO). Normally the entire flow is diverted up to the point where it spills over the Lefthand diversion structure. So the two gages report similar, if not identical, discharges. However, the high flow point when water bypasses LEFTHDCO is not well defined. Measurements made at this gage are sometimes also used for flow at the Lefthand gage, when it is observed that 100% is being diverted.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable, except for the following periods: October 8-11, 22, 26-31, November 1-4, 14-25, 2009 when the gage was ice affected; November 26, 2009 to May 3, 2010, when the gage was off for winter and record is not kept; May 4-18, 2010, when the gage was operating but was heavily ice affected; May 19-31, June 1, 2, 6, 2010, when the gage was ice affected. There was one encoder correction of -0.015 ft on July 8, 2010 applied as a correction back to June 25, 2010 when all equipment readings agreed.
Datum Corrections.--	Levels were run on October 14, 2009. RP was found to be 0.014 ft. high. No correction was made.
Rating.--	The control for low to moderate flow is a rock riffle composed of embedded river boulders approximately 30 feet downstream from the gage. The high water control is a sharp bend and gradient change in the stream channel approximately 50 feet downstream of the gaging station. The control is subject to shifting boulders moving into and out of the control area as well as material embedding and being released from the rock riffle. Rating No. 11 developed in water year 2007 is defined by measurements from 4.74 to 156 cfs. The rating was extended this year to 510 cfs to include a 2009 measurement of 317 cfs. Ten measurements (Nos. 202-211) were performed this year ranging in discharge from 3.34 cfs to 276 cfs. They cover the range of stage experienced this water year. The peak discharge of 325 cfs occurred at 2315 June 7, 2010 at a gage height of 3.06 feet with a shift of -0.01 ft. It exceeded measurement No. 205 made that same day by 0.07 feet of stage. The peak gage height of 3.13 feet occurred at 0000 June 6, 2010 and was ice affected.
Discharge.--	Shifting control method was used all year. Moss growth and debris accumulation is generally not an issue at this gage; however fill and scour conditions as well as control movement do occur. Unadjusted shifts ranged from -0.08 feet to +0.05 feet. All measurements were given full weight. In past years variable stage shifts have been used at this gage, often adjusting many measurements to create the table. In 2010, it was observed that much better agreement was seen with the downstream gage LEFTHDCO when all shifts at both were distributed by time without adjustments. While some degree of stage related shifting at this gage is evident from the shift graph, the measurement frequency and timing appeared to compensate. This year all measurements were given full weight and shifts were applied as follows: October 1-November 25, 2009, continued to use same variable shift table in effect for end of WY 2009 record; May 19 to June 2, 2010, no shifts applied, flows estimated from downstream gage (LEFTHDCO); June 2-September 30, 2010, shift distribution by time.
Special Computations.--	Discharges for ice affected periods were estimated using good adjacent record and measurements made during the periods with consideration to the downstream station, LEFTHDCO. The estimates are considered poor since LEFTHDCO also had ice affect. This is a partial year record. No discharge record is available for the winter period (November 26, 2009 to May 18, 2010).
Remarks.--	The record is good, except October 8-11, 22, 26-31, November 1-4, 14-25, 2009, June 6, 2010 are estimated and poor due to ice, and May 19-31, June 1-2, 6, 2010 are estimated and fair due to ice. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Defining high flows remains a problem. High water measurements at or above 140 cfs cannot be waded. Crane measurements off the bridge at the gage are difficult and poor due to turbulence caused by a constriction at the bridge abutments, high velocities, and debris firmly lodged in the channel bed at the bridge section. Due to the remoteness of this gage, efforts to find a more suitable measurement location have been unsuccessful. Moreover, under high water conditions measurement at LEFTHDCO is not an option due to diversion practices and supercritical velocities encountered at the only available cabling location due to the LEFTHDCO structure lay out. Grooming the cabling section at this gage prior to high flow and shortening the inlets to avoid possible drawdown effects are suggested.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06722500 SOUTH SAINT VRAIN NEAR WARD

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6	3	---	---	---	---	---	---	121	95	41	11
2	6.2	4	---	---	---	---	---	---	112	116	43	9.4
3	7.7	4	---	---	---	---	---	---	111	104	64	9.1
4	5.7	4	---	---	---	---	---	---	152	93	65	8.8
5	7	4.3	---	---	---	---	---	---	214	78	55	8.3
6	7.9	4.3	---	---	---	---	---	---	236	67	43	8.1
7	5.4	4.3	---	---	---	---	---	---	266	68	36	7.6
8	6	4.3	---	---	---	---	---	---	253	71	34	8
9	6	4.1	---	---	---	---	---	---	213	67	34	8.2
10	6	3.9	---	---	---	---	---	---	202	62	31	8.4
11	6	3.8	---	---	---	---	---	---	173	61	42	7.6
12	5.9	3.8	---	---	---	---	---	---	200	62	43	7
13	5.7	3.7	---	---	---	---	---	---	152	65	40	6.2
14	6.8	3	---	---	---	---	---	---	123	67	38	6.1
15	8.1	3	---	---	---	---	---	---	90	63	36	6.1
16	7	3	---	---	---	---	---	---	92	57	35	5.7
17	6	3	---	---	---	---	---	---	100	49	40	5
18	6	3	---	---	---	---	---	---	102	45	40	4.2
19	5.7	3	---	---	---	---	---	14	117	42	40	3.8
20	5.7	3	---	---	---	---	---	17	122	42	42	3.4
21	6.3	3	---	---	---	---	---	24	105	42	37	3.2
22	6	3	---	---	---	---	---	32	105	45	34	3.4
23	5.5	3	---	---	---	---	---	39	109	45	31	4.2
24	4.8	3	---	---	---	---	---	42	116	41	30	3.9
25	4.8	3	---	---	---	---	---	34	117	38	28	3.5
26	5	---	---	---	---	---	---	40	121	36	22	3.3
27	5	---	---	---	---	---	---	51	120	33	16	3.4
28	4	---	---	---	---	---	---	73	111	32	14	3.4
29	3	---	---	---	---	---	---	109	102	36	13	3.4
30	3	---	---	---	---	---	---	112	95	42	12	3.3
31	3	---	---	---	---	---	---	122	---	41	12	---
TOTAL	177.2	87.5	---	---	---	---	---	709	4252	1805	1091	177.0
MEAN	5.72	3.5	---	---	---	---	---	54.5	142	58.2	35.2	5.9
AC-FT	351	174	---	---	---	---	---	1410	8430	3580	2160	351
MAX	8.1	4.3	---	---	---	---	---	122	266	116	65	11
MIN	3	3	---	---	---	---	---	14	90	32	12	3.2

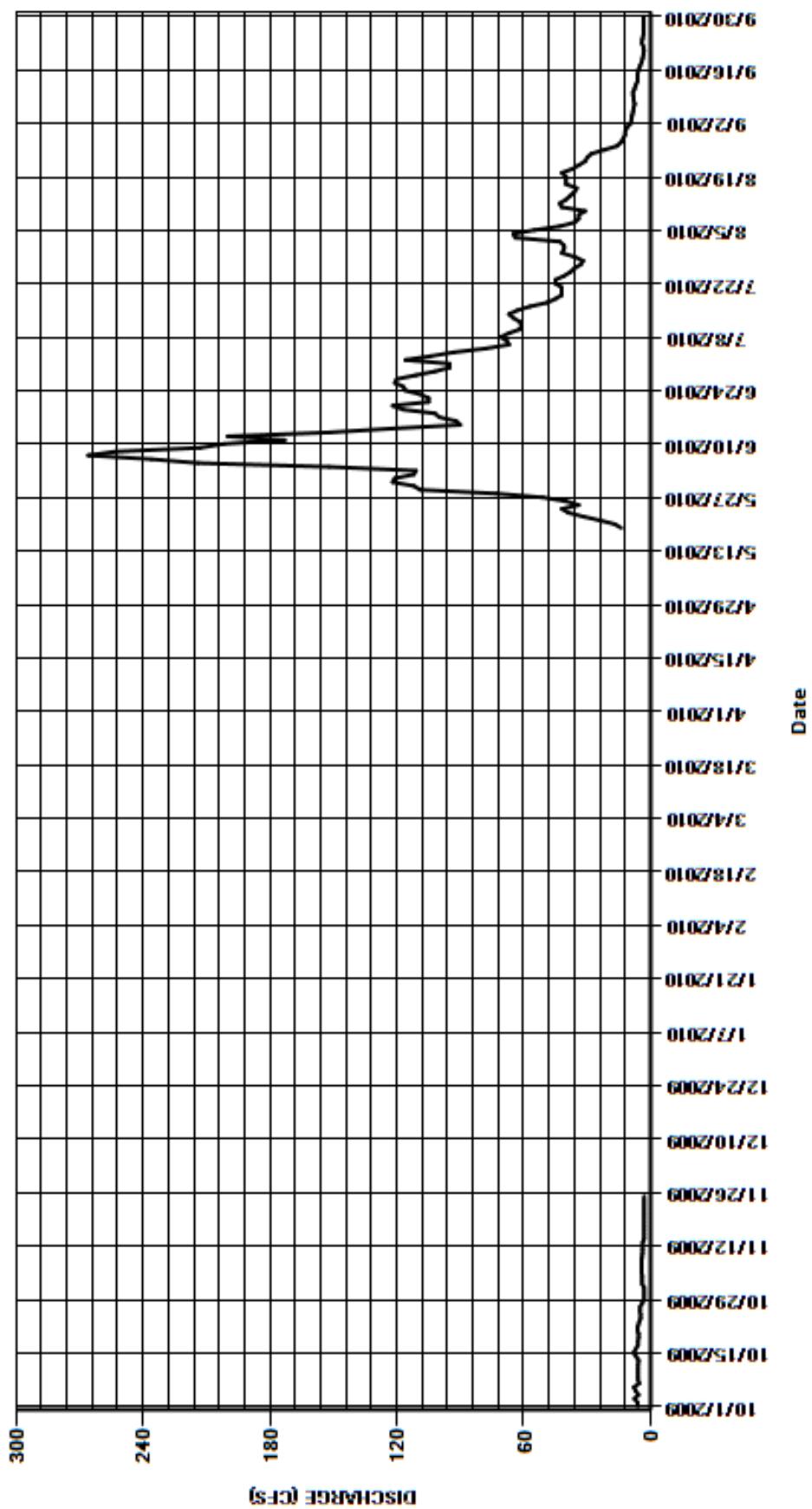
CAL YR	2009	TOTAL	9566.6	MEAN	48.1	MAX	300	MIN	3	AC-FT	18980	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	8298.7	MEAN	43.4	MAX	266	MIN	3	AC-FT	16460	(PARTIAL YEAR RECORD)

MAX DISCH: 325 CFS AT 23:15 ON Jun. 07,2010 GH 3.06 FT. SHIFT -0.01 FT.

MAX GH: 3.13 FT. AT 00:00 ON Jun. 06,2010 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**06722500 SOUTH SAINT VRAIN NEAR WARD
WY2010 HYDROGRAPH**



PLATTE RIVER BASIN
LEFT HAND DIVERSION NEAR WARD
Water Year 2010

Location.--	Lat. 40°05'29", Long. 105°30'31", the gage is located ½ mile downstream from gage on S. St. Vrain Creek off Highway 72.
Drainage and Period of Record.--	Established station on May 21, 1992 at request of Water Commissioner for administration of water rights in District 5, Div. 1. The gage is located one-quarter mile downstream from gage on South Saint Vrain Creek off Highway 72. This station is operated as a partial year record station usually from May to October.
Equipment.--	Graphical water-stage recorder, Sutron shaft encoder and a Sutron Satlink data collection platform (DCP) in a 36-inch diameter corrugated metal pipe shelter and 42-inch concrete well. The well is connected to the channel with two two-inch polyvinyl conduit (PVC) inlets. The PVC inlets are equipped with ball valves, street keys and flushing risers. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrologic Conditions.--	Semi-regulated diversion point. This gage measures water diverted from the South Saint Vrain Creek into James Creek and thence to Lefthand Creek in the Boulder Creek watershed. Diversions usually encompass the entire flow of the South Saint Vrain Creek at this point. The drainage area listed for the upstream gage, South Saint Vrain Near Ward, CO (SSVWARCO) is 14.3 sq mi consisting of virtually uninhabited forested lands. The SSVWARCO gage is approximately 3.5 miles below Brainard Lake and approximately 0.4 miles above the Left Hand Diversion at South Saint Vrain Creek (LEFTHDCO) gage. The LEFTHDCO diversion structure is comprised of a concrete diversion dam, and a 10-foot wide radial gate with trash rack located approximately 55-feet upstream from the control. The radial gate is operated in such a way that it is under pressure for a majority of the season creating a somewhat regulated diversion. Due to this operational regime, peaks and troughs encountered by the SSVWARCO gage can be somewhat attenuated at this gage. Some inflow is expected to occur between the SSVWARCO and LEFTHDCO gage during runoff and storm events which accounts for some computational differences. Travel time between gages is approximately 30 min, therefore minimal time lag effect.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable, except for the following periods: October 10-11, 22, 27-31, November 1-5, 14-16, 2009, when the gage was ice affected; November 17, 2009 thru May 18, 2010, when the gage was off for winter season. The gage was turned on May 4, 2010 but the well was frozen. The well was open on May 25. May 19 was determined to be the first usable day by the presence of a diurnal. Instrument agreement was good (+/- 0.02 feet) between the primary data set and the backup chart record for this period. The peak stage value encountered this year occurred during a period when the Diversion was attempting to dry the creek. On June 6, the Diversion gate was lowered, allowing some of the SSVWARCO water to spill over the dam. Gate closed days are documented in the spreadsheet comparing flows between the two gages.
Datum Corrections.--	Levels were last run on October 14, 2009. The RP was found to be 0.008 ft. high. No corrections were needed. Point of zero flow (PZF) was last verified on September 24, 2005 and determined to occur at a gage-height of 0.86 feet.
Rating.--	The control is a broad crested concrete dam approximately 10 feet below the gage shelter. Rating No. 3 in use since October 2005 was used again this water year. It was extended in Water Year 2009 to include Measurement 143, the highest measurement recorded at this gage. Flows above approximately 90 cfs cannot be measured at the gage, therefore high water measurements must be made upstream at SSVWARCO and applied to LEFTHDCO. Previously rating No 3 had been extended to 296 cfs based on a high measurement of 156 cfs made in 2006. However, the new high measurement of 316 cfs (No. 143 made June 27, 2009) had a very high shift (+0.37), indicating that the previous extension may not have been accurate. A new rating may be in order if Msmt. No 143 is validated in the future by a similar high flow measurement with a reliable GH. This year flows were again similar to that of last year, however when the peak measurement was made at SSVWARCO, the diversion was not taking all the river and both the diversion and natural channel were both flowing too quickly to measure. Nine measurements (Nos. 149-157) were performed this year ranging in discharge from 3.62 to 111 cfs. They cover the range experienced except for the higher mean daily flows of May 29-June 10, June 26-28, and July 2-3, 2010. Measurement Nos. 151 to 154 (when flow rates were above wadeable limits at LEFTHDCO) were made at the SSVWARCO gage and applied to this gage. Measurement 155 was also measured at SSVWARCO and applied due to dangerous lightning in the area. Measurements applied from SSVWARCO were done when LEFTHDCO was diverting the entire flow and confirmed by field observation. Care was taken to adjust measurements applied from SSVWARCO in the same direction and amounts that were used in the development of the SSVWARCO record. The peak flow of 254 cfs occurred at 0045 June 5, 2010 at a gage height of 2.41 ft with a shift of +0.08 ft. It exceeded measurement 153, made June 25, by 0.31 ft in stage.
Discharge.--	Shifting control method was used all year. Moss and debris accumulation is generally not an issue at this gage however; larger debris such as tree limbs can catch on the control. Velocities are high past the gage and inlet drawdown has been speculated as a source of GH irregularity and consequent shifts. SSVWARCO and LEFTHDCO are in such close proximity to each other that discharges should be quite consistent. When the gages are individually measured, measurements may be adjusted in order to have a good trend between the two stations. In 2010, measurement no. 149 was adjusted 5% in order to show consistent flow between the gages. All measurements made at SSVWARCO that were applied to LEFTHDCO (Nos. 151-155) were given full weight at both stations. Shifts were applied by time with consideration of stage for the entire period of good ice free record. The peak flow period was well defined by 4 measurements (Nos. 150-153) made during May 25-June 25. While a degree of stage shifting was possible, time shifting gave a better balance of flows with SSVWARCO.
Special Computations.--	Discharge was estimated during periods of ice effect using upstream gage (SSVWARCO), adjacent good record, partial record, and temperature trends. This is a partial year record with no record for November 17, 2009 through May 18, 2010. However, diversion continues through the winter and winter figures are estimated in water commissioner records.

Remarks.--

The record is good, except for periods of ice effect, which are estimated and poor. The peak for the water year is considered fair. Station maintained and record developed by Patrick Tyler.

Recommendations.--

High flow measurements are difficult and dangerous to perform at this gage as well as the SSVWARCO gage and are often poor. Due to the remoteness of these gages, other locations for performing high water measurements are not possible. If a bank operated cableway were installed at the SSVWARCO gage, some resolution of these issues may occur. That said, another measurement in the 200-300 cfs range would be very helpful in building a new rating. Such a measurement would need to incorporate observations about gate operation and GH reliability. A staff on the gate pool might help.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LEFT HAND DIVERSION NEAR WARD

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.7	3	---	---	---	---	---	---	127	93	41	12
2	6.7	4	---	---	---	---	---	---	118	128	43	10
3	8.1	4	---	---	---	---	---	---	116	115	67	9.8
4	6.5	4	---	---	---	---	---	---	156	97	70	9.5
5	7.6	4.5	---	---	---	---	---	---	148	77	54	9.1
6	8.3	4.7	---	---	---	---	---	---	167	67	44	8.8
7	6	4.6	---	---	---	---	---	---	118	68	38	8.5
8	7.4	4.7	---	---	---	---	---	---	120	71	36	9.2
9	6.9	4.3	---	---	---	---	---	---	116	66	36	9.5
10	7	4	---	---	---	---	---	---	114	58	32	9.6
11	7	3.9	---	---	---	---	---	---	110	58	42	8.8
12	6.7	4	---	---	---	---	---	---	111	58	43	8.2
13	6.4	3.9	---	---	---	---	---	---	106	63	40	7.5
14	7.3	3	---	---	---	---	---	---	100	65	38	7.3
15	8.8	3	---	---	---	---	---	---	88	61	37	7.1
16	7.7	3	---	---	---	---	---	---	90	53	37	6.7
17	6.6	---	---	---	---	---	---	---	95	47	41	5.9
18	6.7	---	---	---	---	---	---	---	95	43	41	4.5
19	6.5	---	---	---	---	---	---	16	98	43	39	4
20	6.5	---	---	---	---	---	---	19	97	41	42	3.7
21	7	---	---	---	---	---	---	26	90	42	37	3.4
22	7	---	---	---	---	---	---	33	95	44	35	3.5
23	6.3	---	---	---	---	---	---	41	89	45	33	4.4
24	5.4	---	---	---	---	---	---	44	94	42	31	4
25	4.8	---	---	---	---	---	---	36	103	39	28	3.6
26	6	---	---	---	---	---	---	42	126	37	22	3.4
27	5	---	---	---	---	---	---	54	124	33	17	3.5
28	5	---	---	---	---	---	---	78	116	33	15	3.5
29	4	---	---	---	---	---	---	113	104	36	14	3.5
30	3	---	---	---	---	---	---	116	93	43	13	3.4
31	3	---	---	---	---	---	---	126	---	42	13	---
TOTAL	197.9	62.6	---	---	---	---	---	744	3324	1808	1119	195.9
MEAN	6.38	3.91	---	---	---	---	---	57.2	111	58.3	36.1	6.53
AC-FT	393	124	---	---	---	---	---	1480	6590	3590	2220	389
MAX	8.8	4.7	---	---	---	---	---	126	167	128	70	12
MIN	3	3	---	---	---	---	---	16	88	33	13	3.4

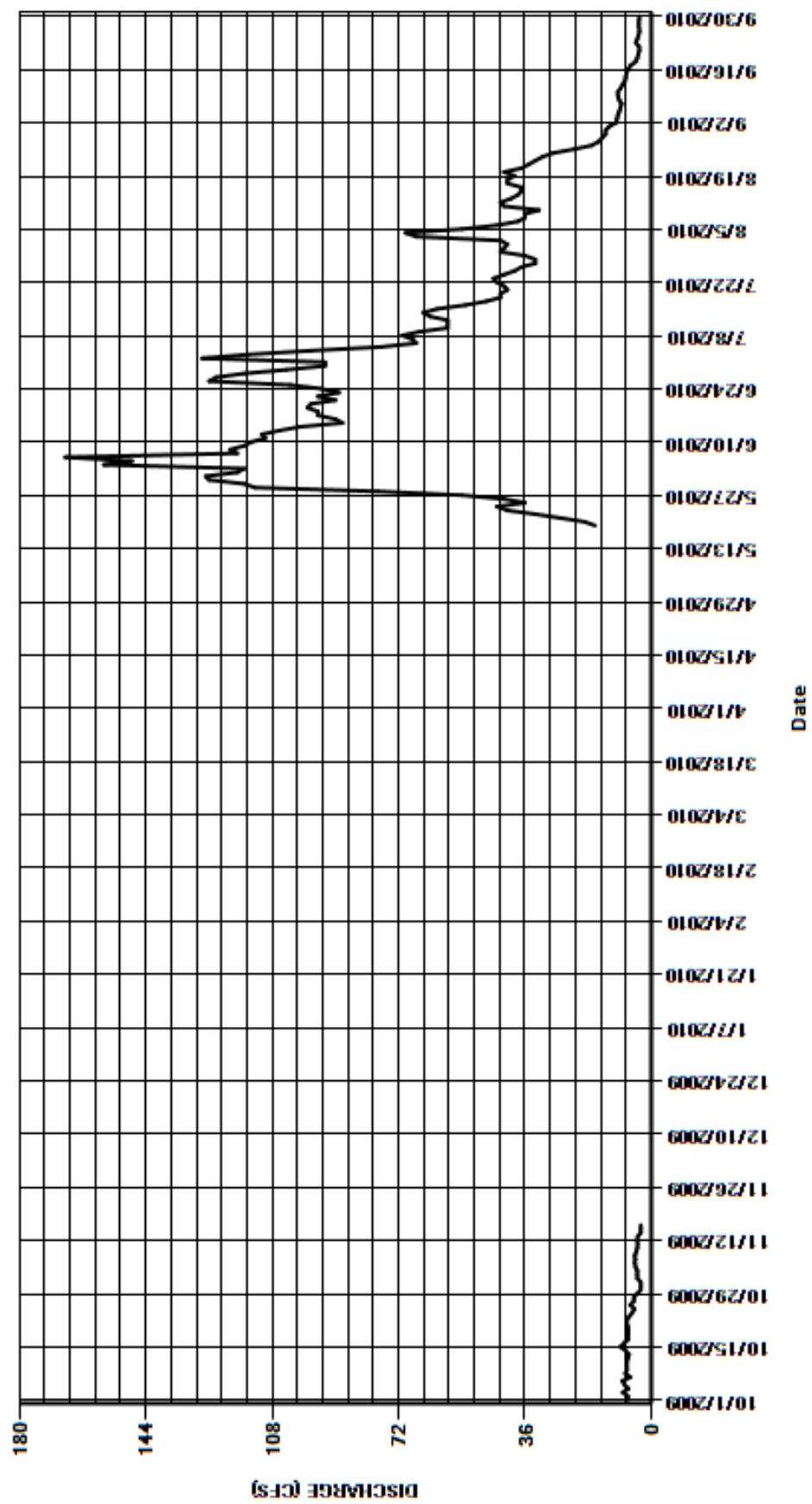
CAL YR	2009	TOTAL	8897.7	MEAN	46.8	MAX	216	MIN	3	AC-FT	17650	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	7451.4	MEAN	40.9	MAX	167	MIN	3	AC-FT	14780	(PARTIAL YEAR RECORD)

MAX DISCH: 254 CFS AT 00:45 ON Jun. 05,2010 GH 2.41 FT. SHIFT 0.08 FT.

MAX GH: 2.41 FT. AT 00:45 ON Jun. 05,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LEFT HAND DIVERSION NEAR WARD
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06724000 SAINT VRAIN CREEK AT LYONS, CO
Water Year 2010

Location.--	Lat. 40°13'05", Long. 105°15'34", in NW 1/4 NW 1/4 sec. 20, T.3 N., R.70 W., Boulder County, Hydrologic Unit 10190005, on left bank 75 ft southwest of U.S. Highway 36 (State Highways 7 and 66) at southeast edge of Lyons, 400 ft upstream from St. Vrain Supply Canal, and 0.4 mi downstream from confluence of North and South St. Vrain Creeks.
Drainage and Period of Record.--	216 mi ² . Aug. 1887 to Sep. 1891, June 1895 to current year. Monthly only data for some periods. Water quality data available from Oct. 1977 to Feb. 1981. On March 23, 2003, the gage was moved approximately 0.2 mi upstream. In the new location, the gage is above the Supply Ditch diversion, whereas the old location was below this diversion.
Equipment.--	Graphical water stage recorder and an incremental shaft encoder connected to a high data rate Data Collection Platform (DCP) in a 6-foot by 6-foot exposed aggregate precast concrete building overtop a 42-inch precast concrete stilling well upstream of a low head concrete diversion dam. An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplementary cantilever chain gage located 10 feet downstream of the shelter. The stilling well is connected to the channel via four 2-inch inlets, three of which are equipped with valves and flushing equipment. A bank operated cableway is located 15 ft downstream from the shelter. A secondary shaft encoder is installed on the instrument shelf of the shelter. This shaft encoder is used for the Highland Ditch Company's Supervisory Control and Data Acquisition (SCADA) system. This instrument is maintained by the Colorado Division of Water Resources (CDWR) and operated such that the instruments stage reading is set to the base gage stage plus or minus the last measured shift.
Hydrologic Conditions.--	Drainage area is mainly comprised of forested and grassy areas with varying topography. Gage is located below the confluence of the south and north forks of the Saint Vrain and below most of Lyons Colorado. Beaver Creek and Button Rock Reservoirs are upstream of this gage as well as numerous other diversions of varying magnitude. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the Town of Lyons, CO.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with chart record as backup. Frequent visits show good agreement between primary and backup records, and the base gage. No flush corrections or inlet plugging events occurred this year. Debris accumulation on the diversion dam was not a problem this year. Accumulated debris was removed from the control on November 30, 2009 resulting in a possible correction of -0.01 feet to the gage. The correction was not applied to the record because the hydrograph was dropping prior to the debris removal. The assumed correction could have been attributable to naturally dropping stage conditions. Otherwise, the gage-height record is complete and reliable, except as follows: December 2, 2009; stage-discharge relationship affected by ice; December 3-6, 2009, gage-height data unreliable due to frozen inlets and a frozen stilling well; December 7, 2009 and March 3, 2010, partial day records corresponding to winter deactivation and spring reactivation days ; December 8, 2009 – March 2, 2010, no gage-height information available, gage was offline for winter.
Datum Corrections.--	Levels were run to the inside gage on September 9, 2010 using R.M. No. 2 as base. The gage was found within the allowable threshold of ±0.02 feet. As such, no correction was required nor made.
Rating.--	The control for low to mid level stages is a low-head concrete diversion dam for the Supply Ditch approximately 570 feet below the gage. At higher stages the gage reverts to channel control; which, has not been fully defined since the gage relocation to this location in 2003. The diversion dam and ditch check structure approximately 1000 feet below the gage can gather debris and cause backwater conditions at the gage under certain operational circumstances. Rating No. 26 in use since October 1, 2009 is defined by measurements from 13.6 to 1230 cfs. Twenty-five measurements (Nos. 574-598) were performed this water year ranging in discharge from 16.8 to 1230 cfs. Measurements Nos. 582, 583 and 590 were performed with a Teledyne RD Instruments StreamPro Acoustic Doppler Current Profiler (ADCP). Nos. 582 and 583 were deemed unreliable and were not used in this evaluation. Measurement No. 594 was performed with a Sontek FlowTracker acoustic velocity meter. Measurements made this water year cover the range in stage experienced this year well. The peak discharge of 1550 cfs occurred at 0015 June 6, 2010 at a gage height of 3.86 ft with a shift of 0.00 feet. It exceeded measurement No. 585 (1230 cfs) by 320 cfs.
Discharge.--	Shifting control method all year. Fill and scour conditions as well as debris accumulation on the low water control contributed to shifting away from the rating. Unadjusted shifts ranged from -0.01 to +0.05 feet. Shifts were applied by time with consideration of stage for the entire water year. Msmt Nos. 575, 586, 588-590, 594, 599 were adjusted -5% to +6% to smooth shift distribution. ADCP measurements Nos. 582 and 583 were deemed non-representative and were not used .
Special Computations.--	Discharge for the ice affected period (December 2 -6, 2009) was estimated from adjacent periods of good record and temperature trends. Similarly, discharges for the winter period (December 7, 2009 – March 3, 2010) was estimated from adjacent good record, measurements made during the period (Nos. 577-580) and temperature trends logged at this site.
Remarks.--	The record is good except for periods of ice effect and no gage height record, which are estimated and poor. Station maintained and record developed by Russell V. Stroud .
Recommendations.--	Special care needs to be taken when performing Bank Operated Cableway (BOC) measurements. BOC measurements are often difficult to sound correctly and may introduce error into the measurement. Therefore, measurement rating is important. Verification of high flows from downstream diversions may be considered in the future. ADCP measurements made using the Bank Operated Cableway apparatus returned discharges higher than current meter measurements made concurrently at similar stages. Evaluation for use of the ADCP for higher and high flow measurements should be continued but must be made concurrently with a current meter measurement. Control and diversion check structure should be monitored for accumulated debris that may cause backwatering conditions. Levels need to run in the 2011 water year to monitor any subsequent settling of the new shelter. The addition of one to two additional reference marks is highly recommended.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06724000 SAINT VRAIN CREEK AT LYONS, CO

RATING TABLE--

SVCLYOCO26 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

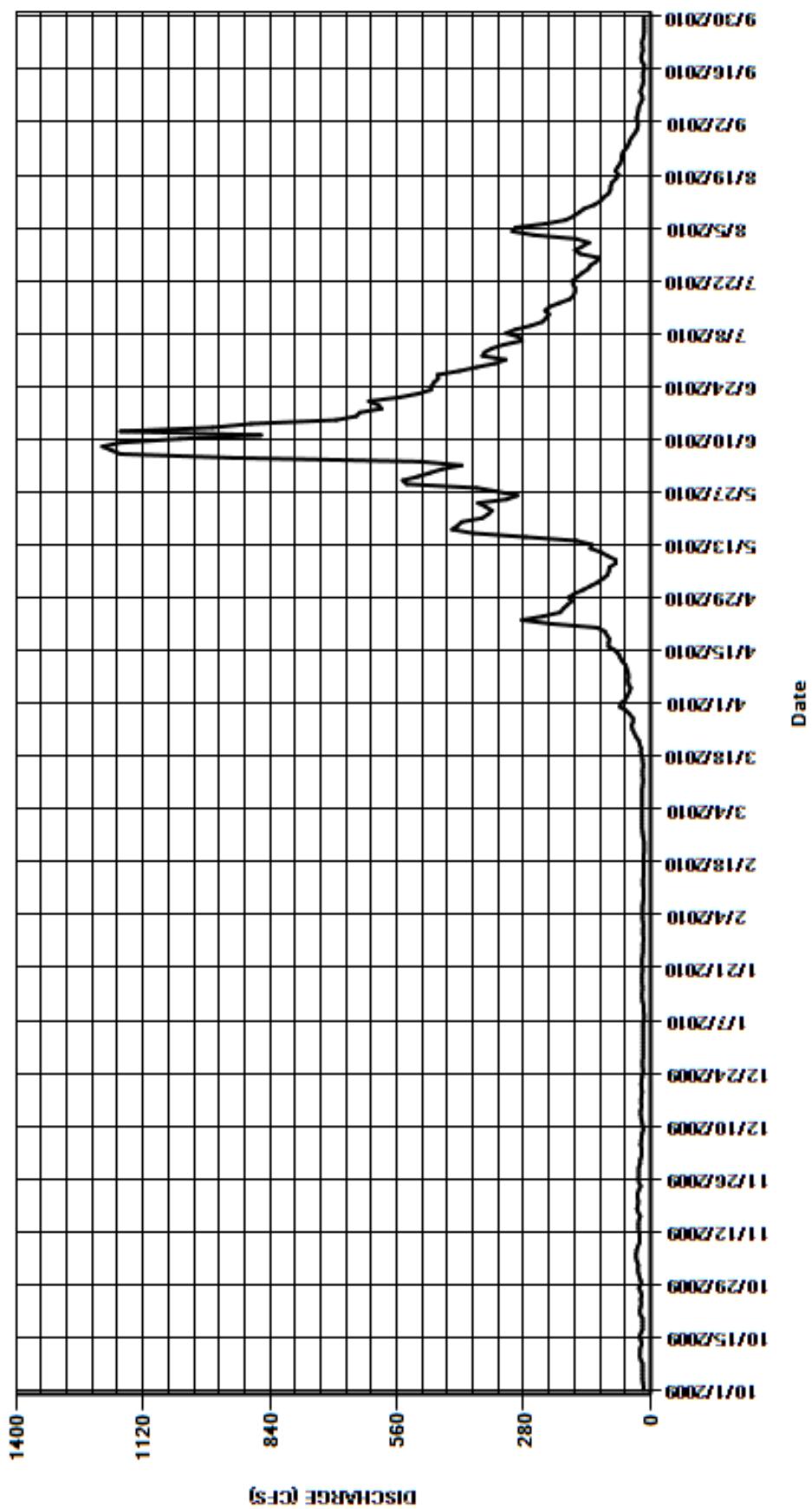
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	27	23	17	16	19	65	149	487	320	136	28
2	16	28	20	17	17	19	55	133	460	371	164	28
3	17	27	20	17	18	19	51	117	417	366	257	31
4	18	30	20	17	18	19	47	105	509	350	305	29
5	18	32	22	17	18	19	44	95	924	323	298	27
6	18	32	21	17	18	19	49	92	1170	284	232	26
7	18	31	20	15	17	19	50	91	1190	291	188	22
8	18	28	19	14	16	19	49	77	1210	319	170	18
9	22	25	16	15	15	19	50	78	1170	298	158	19
10	24	24	18	15	15	18	53	95	1040	264	147	23
11	23	24	19	16	16	17	55	110	860	239	125	20
12	23	26	21	18	17	17	62	133	1170	231	111	17
13	20	27	22	19	17	18	67	130	967	224	104	16
14	21	27	22	19	16	18	71	163	882	233	93	17
15	25	26	20	18	16	17	79	276	694	223	89	17
16	22	23	21	18	15	17	93	392	650	202	88	14
17	18	27	21	19	16	18	93	438	642	179	85	14
18	18	30	20	19	16	19	91	426	594	170	76	19
19	18	28	19	19	16	22	97	417	601	167	71	21
20	18	27	20	18	15	21	101	372	622	167	78	19
21	23	29	21	18	14	24	118	359	555	171	73	17
22	24	29	20	19	14	26	218	350	512	172	67	18
23	22	26	19	19	14	32	284	364	485	161	64	19
24	21	22	17	18	16	36	237	381	483	151	64	17
25	22	26	17	17	17	40	200	317	478	138	61	15
26	20	27	18	17	18	42	193	294	469	133	54	14
27	22	26	18	17	19	39	184	337	470	120	49	14
28	26	26	17	16	19	39	174	384	422	114	46	14
29	21	26	17	16	---	46	181	538	384	155	41	14
30	22	23	17	17	---	54	168	547	343	167	35	15
31	25	---	17	17	---	68	---	514	---	151	30	---
TOTAL	639	809	602	535	459	819	3279	8274	20860	6854	3559	582
MEAN	20.6	27	19.4	17.3	16.4	26.4	109	267	695	221	115	19.4
AC-FT	1270	1600	1190	1060	910	1620	6500	16410	41380	13590	7060	1150
MAX	26	32	23	19	19	68	284	547	1210	371	305	31
MIN	16	22	16	14	14	17	44	77	343	114	30	14
CAL YR	2009	TOTAL	41485	MEAN	114	MAX	869	MIN	13	AC-FT	82290	
WTR YR	2010	TOTAL	47271	MEAN	130	MAX	1210	MIN	14	AC-FT	93760	

MAX DISCH: 1550 CFS AT 00:15 ON Jun. 06,2010 GH 3.86 FT. SHIFT 0 FT.

MAX GH: 3.86 FT. AT 00:15 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06724000 SAINT VRAIN CREEK AT LYONS, CO
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06725500 MIDDLE BOULDER CREEK AT NEDERLAND
Water Year 2010

Location.--	Lat. 39°57'42", Long. 105°30'14", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T.I S., R.73 W., Boulder County, Hydrologic Unit 10190005, on left bank at Nederland just downstream from North Beaver Creek at inlet to Barker Reservoir.
Drainage and Period of Record.--	36.2 mi ² . June 1907 to present.
Equipment.--	Graphic water-stage recorder and Sutron High Data Rate (HDR) data collection platform (DCP) with shaft encoder in timber shelter and concrete well at a sharp-crested Cipolletti weir with overflow rectangular crests and outside staff gage. City of Boulder maintains gage and chart recorder.
Hydrologic Conditions.--	The drainage area consists of undeveloped forest and continental divide watershed. There are few diversions and only small effects from the town. The channel is rock and cobble and is straight for about 250 ft upstream of the gage, however in the last year high flow has deposited large quantities of cobble of all sizes. The stream has split into two channels at 100 ft to 150 ft. above the dam before it flows into stilling pool. During the winter, ice forms complete cover over the creek and weir for short periods from November to March.
Gage-Height Record.--	Primary record is hourly averages of 15-minute telemetered data with chart backup. Record is complete and reliable, except for the following periods where gage heights are unreliable due to ice and possible ice: October 9-12, 30, November 16-18, 24-25, December 3-31, 2009, January 1-31, February 1-28, March 1-17, 20-29, and April 2-3, 7-9, 2010. One equipment correction was required this year. It was applied and prorated from June 3, 2010 back to a known point of correct reading on May 21, 2010.
Datum Corrections.--	Levels were last run on Oct. 28, 2010. No correction was necessary to RP or tape. RM No. 1 was measured as having an elevation of 4.955 ft. rather than the 4.97 ft. established on August 16, 2006, or the original 5.00 ft. used for many years prior to that. RM No. 3 was measured as having an elevation of 4.867 ft. instead of the established 4.89 ft (establishment date unknown). Neither RM was re-established at this time, however levels should be run again in Water Year 2011 to verify and re-establish if needed. An outside adjustable reference point was also added this year in order to get better readings on the stilling pool. The staff is in bad repair and also a bad location. The new outside reference point will be read using the same drop tape as inside the shelter and is located directly west of the shelter door on the hand rail for the platform.
Rating.--	The control is a six-foot sharp-crested Cipolletti weir with rectangular weir sections for flow above 1.0 foot. The weir pool freezes in the winter, but the weir continues to operate apparently well. Rating No. 7, in use since October 1, 1973 was continued this year. It has been confirmed by measurements to 419 cfs. The cableway was removed for safety reasons and high flow measurements are no longer possible at the gage. No possibilities exist for bridge measurements. Maximum wade is approximately 200 cfs (due to rocky channel and unevenly distributed flow through the channel). Ten measurements (50 - 59) were made this Water Year, ranging in discharge from 7.97 to 173 cfs. The peak flow of 642 cfs occurred at 2145 June 6, 2010 at a gage height of 3.8 ft with a shift of 0.00 ft.
Discharge.--	Shifting section control method used all year. Measurements show unadjusted shifts varying between -0.13 and 0.07 feet. Shifts were distributed by time proration with consideration of stage and peak events for the water year. Measurements were given full weight and applied except for measurement Nos. 50, 57 and 58 which were adjusted up to 4% to smooth shift distribution. Measurement No. 53, and made with an ADCP and rated fair due to unstable ADCP readings throughout the section, was the highest flow measured this year and was also adjusted 8% to the rating.
Special Computations.--	The ice days were determined by chart inspection and by identifying days when the maximum temperature dropped below freezing and the computed flow increased. Many other winter days had a small rise around noon. This rise might have been diurnal flow or it might have been ice melting, breaking off, and jamming on the weir. Without more information it was not possible to tell if the record was ice affected on these "bump" days. Discharge for ice affected days with false peaks was computed on the basis of partial day records, by cutting off some ice peaks on graphic chart, and inserting estimated values into the daily database. Some days did not have an obvious ice affect, but showed increasing discharge when the temperatures were dropping well below freezing. For these days discharges were estimated by using computed discharges during warmer periods, graphic estimation, and temperature trends.
Remarks.--	The record is good, except for periods of ice effect, which are estimated and considered poor. The flows associated with the high flow measurement (No. 53) are considered Fair due to the measurement itself being downgraded. The dates affected by this are May 21 through June 28, 2010. Flows associated with large, unexplained jumps in stage should also be considered fair on Aug. 6-27, 2010 and Sept 1-30, 2010. The instantaneous peak flow recorded on June 6, 2010 is also fair to poor due to lack of rating definition. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Visits by Boulder personnel to keep the weir clear of ice in the winter should be confirmed. Station should be visited more often to check the control. Further establishment of outside RP with regular readings to ensure well functioning properly. A velocity dissipation structure upstream of the stilling pool should be considered.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06725500 MIDDLE BOULDER CREEK AT NEDERLAND

RATING TABLE--

BOCMIDCO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

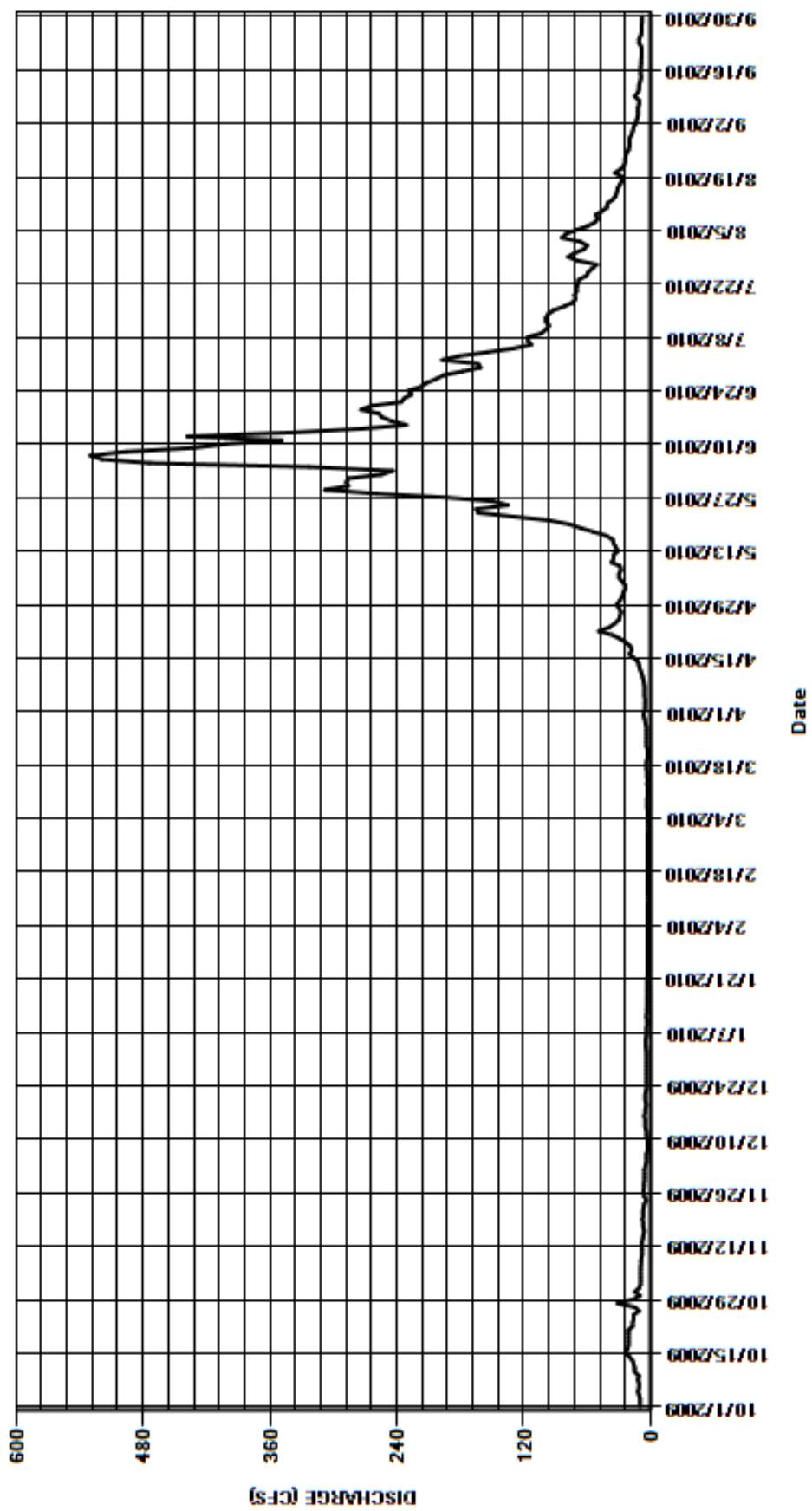
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	11	5.6	4	2.7	2.5	6	27	286	163	60	16
2	10	9.5	5.8	4	3	2.6	5.2	26	255	197	67	14
3	10	9.3	5	4.5	2.9	2.7	5.4	24	244	182	84	13
4	11	9.4	4	5	2.9	2.8	5.1	24	323	155	80	12
5	12	9.5	4	4.8	2.7	3	5.7	27	474	130	71	12
6	11	9.3	4	4.1	2.9	3	5.7	30	519	113	60	12
7	11	9.3	3	3.9	2.7	3.3	5.5	30	530	116	53	11
8	12	9.2	3	3.9	2.8	3.2	6	28	496	116	50	11
9	11	8.7	3	3.4	2.7	3.3	6.6	29	432	103	52	15
10	15	7.9	3	3.4	2.7	3.1	7.6	37	402	99	46	12
11	15	8	4	3.9	2.6	3	8.8	35	349	96	41	11
12	16	8.2	4	3.6	2.7	3	10	35	438	99	41	11
13	17	8.3	5	3.5	2.7	3.3	11	31	339	99	36	9.7
14	20	7.4	5	3.3	2.9	3	12	33	273	97	33	9.2
15	24	6.8	5	3.2	2.7	3.4	16	35	231	92	32	9.4
16	22	6	6	3.3	2.7	3.3	20	36	245	82	31	9.3
17	21	7	5	3.2	2.9	3.8	18	42	254	74	29	9.3
18	21	7	5	3.3	2.7	4.1	19	54	257	71	27	9
19	21	7.7	4	3.2	2.8	3.7	23	66	274	72	27	8.8
20	21	7	5	3.2	2.8	3	29	77	264	70	34	8.6
21	21	7.2	5	3.3	2.9	3	36	96	236	70	28	8.6
22	17	6.7	5	3	2.8	3	49	130	233	69	25	8.9
23	17	6	4	3	2.8	4	39	163	226	68	24	11
24	16	4	4	3	2.8	4	34	165	229	61	24	11
25	16	6	4	3	2.9	4	30	135	217	59	23	9.2
26	11	6.5	4	3	2.8	4	29	149	212	55	21	8.6
27	15	6.5	4	3	2.7	4	28	193	203	51	20	8.4
28	31	6.2	4	3	2.8	4	30	259	196	69	20	8.4
29	17	5.9	4	3	---	5	32	308	178	78	20	8.2
30	10	5.7	4	3	---	5.6	29	286	161	72	18	8.1
31	15	---	4	3	---	6.7	---	288	---	63	17	---
TOTAL	497	227.2	134.4	108.0	78.0	110.4	561.6	2898	8976	2941	1194	313.7
MEAN	16	7.57	4.34	3.48	2.79	3.56	18.7	93.5	299	94.9	38.5	10.5
AC-FT	986	451	267	214	155	219	1110	5750	17800	5830	2370	622
MAX	31	11	6	5	3	6.7	49	308	530	197	84	16
MIN	10	4	3	3	2.6	2.5	5.1	24	161	51	17	8.1
CAL YR	2009	TOTAL	19952.7	MEAN	54.7	MAX	415	MIN	3	AC-FT	39580	
WTR YR	2010	TOTAL	18039.3	MEAN	49.4	MAX	530	MIN	2.5	AC-FT	35780	

MAX DISCH: 642 CFS AT 21:45 ON Jun. 06,2010 GH 3.8 FT. SHIFT 0 FT.

MAX GH: 3.8 FT. AT 21:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06725500 MIDDLE BOULDER CREEK AT NEDERLAND
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06727000 BOULDER CREEK NEAR ORODELL
Water Year 2010

Location.--	Lat. 40°00'23", Long. 105°19'49", in NE 1/4 SW 1/4 sec. 34, T.I N., R.71 W., Boulder County, Hydrologic Unit 10190005, on left bank along State Highway 119, 0.7 mi southwest of old Orodell, 1.1 mi upstream from Fourmile Creek, and 2.9 mi southwest of courthouse in Boulder.
Drainage and Period of Record.--	102 mi ² . 1906 to present.
Equipment.--	Graphic water-stage recorder and Sutron 8210 DCP high data rate with shaft encoder in a 6 foot by 6 foot concrete shelter with a 54-inch corrugated metal well. The primary reference is a tape down from RP. There is an outside staff gage across the stream that reads approximately 1 foot lower than gage datum. The gage has AC power to keep the well open. The station also has a pressure transducer and telemetry installed by Urban Drainage and Flood Control District.
Hydrologic Conditions.--	Flows are regulated by storage in Barker Reservoir, and by diversion from Barker for power generation. Hydropower water is returned a few hundred feet above the gage and displays a step and peak hydrograph. A constant release is maintained from Barker throughout the year. In past years power was generated in the winter keeping the gage open. With the purchase of the Barker system by the City of Boulder, power is no longer generated through the entire winter (although they plan on running it as much as possible through the winter from now on).
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable, except as follows: November 14, 2009 to March 6 2010 and March 19-21, 2010, when the gage was ice affected due to ice in channel and sometimes in well and frozen inlets at times; September 29-30, 2010, when the inlets plugged and a release from power plant above gage on Sept 29 was not reliably recorded. Gage was determined to be recording correctly after inlet flushing on Sept 30. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 22 visits made to the gage this year. Two instrument corrections were made this year on Dec. 28, 2009 and Aug. 20, 2010. They were applied and prorated back to last point of known matching gage height.
Datum Corrections.--	Levels were last run on October 28, 2010. The tape length was adjusted to 11.317 ft. This correction does not affect the WY2010 record.
Rating.--	The control is a cobble and boulder riffle 60 feet below the gage. The channel is the control for higher stages. This station is subject to shifting caused by cobble and boulders moving in and out of still pool and over control. Rating No. 14, in use since WY 2005, was continued this year. Rating 14 is defined to 757 cfs by measurements. Sixteen measurements (491 - 506) were made this year, and ranged in discharge from 12.1 to 757 cfs. Measurements cover the range in mean daily flows experienced this water year. The peak flow of 964 cfs occurred at 0615 June 7, 2010 at a gage height of 3.55 ft with a shift of 0.06 ft. It exceeded Measurement No. 501, made June 6, 2010, by 0.14 feet in stage.
Discharge.--	Shifting control method was used all year. Moss and debris accumulation is not an issue at this gage; however fill and scour conditions as well as control movement does occur. Additionally, boulders comprising the control are subject to becoming lodged or dislodged during runoff events. This year there was much movement among the cobble within the typical measurement section causing many measurements to be downgraded. Measurements show unadjusted shifts varying between -0.10 and 0.06 feet. All measurements were given full weight. Shifts were applied strictly by time proration, although some average daily shifts were adjusted so that days with the same mean gage height had the same shift.
Special Computations.--	Discharges for the winter period were estimated from the 5 measurements made and discharges from the Boulder Creek at Boulder (BOCOBODO) gage. No diversions were active in the winter between BOCOBODO and BOCOROCO. Basically the figures for BOCOBODO were used, since these were not inconsistent with the measurements at BOCOROCO. Minor winter inflows from Fourmile Creek might result in the estimates being a little high. Discharges for September 29-30 were derived by comparison to hourly and daily flows from the downstream gage for those days.
Remarks.--	Record is good, except for the following periods of ice affect and plugged inlets, which are estimated and poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	High flow measurements have been questionable in the past however WY 2009 and WY 2010 show promise in defining the upper end of the rating. More diligence is needed to define the upper and lower ends. A correction will be required in the 2011 record for changing the tape length on October 28, 2010.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06727000 BOULDER CREEK NEAR ORODELL

RATING TABLE--

BOCOROCO14 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	23	18	15	8	12	26	72	210	217	115	33
2	22	22	14	14	8	12	22	66	266	260	116	31
3	20	23	11	14	9	12	22	59	310	282	128	26
4	21	23	13	9	9	12	20	54	389	243	124	25
5	21	24	15	13	8	12	20	51	688	218	120	24
6	21	18	17	11	8	12	25	52	780	188	110	23
7	21	19	17	7	8	13	23	54	819	187	87	22
8	21	19	17	7	8	13	24	50	817	195	80	24
9	21	19	17	8	7	13	25	48	679	187	81	24
10	21	18	17	8	7	13	27	53	640	175	80	23
11	20	18	19	9	8	13	26	53	547	158	62	22
12	19	17	20	9	8	14	30	50	767	145	56	22
13	18	15	20	9	8	14	34	50	640	128	57	22
14	18	15	19	9	8	14	35	57	596	121	51	22
15	21	15	17	9	8	14	40	81	438	123	52	22
16	21	11	16	9	9	15	49	90	410	116	50	22
17	20	17	16	12	10	15	46	104	412	109	48	20
18	20	18	16	13	11	16	47	111	408	105	44	20
19	19	17	15	12	9	16	51	110	427	105	41	20
20	19	15	16	12	9	15	59	107	430	104	47	19
21	20	16	15	10	9	16	69	105	381	97	42	17
22	20	17	15	10	9	16	101	101	363	92	44	16
23	19	14	16	11	9	17	100	101	340	95	45	18
24	19	7	14	10	9	21	92	91	342	99	40	17
25	20	14	14	12	9	24	82	73	325	87	39	17
26	19	18	16	12	8	21	80	69	309	80	36	16
27	19	16	15	13	13	21	78	77	308	79	35	16
28	20	17	14	13	12	18	82	111	292	77	33	16
29	21	16	15	13	---	19	88	195	266	100	34	19
30	20	16	15	10	---	23	80	311	230	120	33	18
31	21	---	14	8	---	29	---	283	---	116	34	---
TOTAL	625	517.0	493	331.0	246.0	495	1503	2889	13829	4408	1964	636
MEAN	20.2	17.2	15.9	10.7	8.79	16	50.1	93.2	461	142	63.4	21.2
AC-FT	1240	1030	978	657	488	982	2980	5730	27430	8740	3900	1260
MAX	23	24	20	15	13	29	101	311	819	282	128	33
MIN	18	7	11	7	7	12	20	48	210	77	33	16

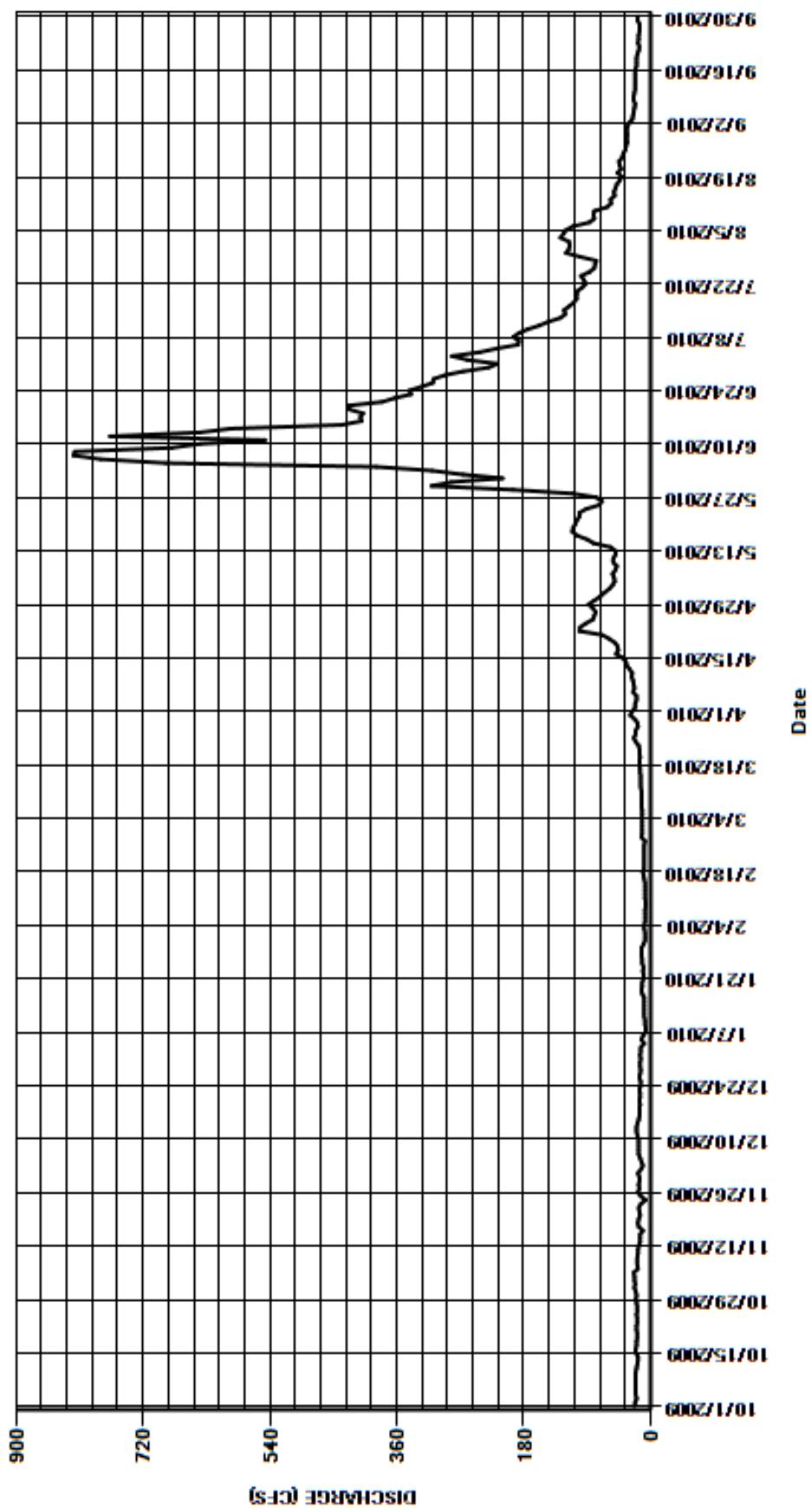
CAL YR	2009	TOTAL	30014.0	MEAN	82.2	MAX	755	MIN	7	AC-FT	59530
WTR YR	2010	TOTAL	27936.0	MEAN	76.5	MAX	819	MIN	7	AC-FT	55410

MAX DISCH: 964 CFS AT 06:15 ON Jun. 07,2010 GH 3.55 FT. SHIFT 0.06 FT.

MAX GH: 3.55 FT. AT 06:15 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06727000 BOULDER CREEK NEAR ORODELL
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK AT BOULDER, CO
Water Year 2010

Location.--	Lat 40° 00' 53", long 105° 16' 49", in SW SW Sec. 30, T.1N., R.70W., Boulder County, on right bank in Central Park, 1 block West of the Broadway St. Bridge over Boulder Creek. Gage is located where the center line from 11th St crosses Boulder Creek.
Drainage and Period of Record.--	N/A. May 2004 to present.
Equipment.--	Sutron SatLink2 with a Sutron Constant Flow Bubbler (CFB) in a 3 ft x 2.5 ft x 1 ft NEMA shelter. The primary reference is a staff gage placed on the right side of the channel slightly downstream from the shelter.
Hydrologic Conditions.--	Flows are regulated by storage in Barker Reservoir, and by diversions below Barker Reservoir. Other flows include North Boulder Creek, which converges with Middle Boulder Creek above Boulder Creek at Orodell, (BOCOROCO). The channel generally will stay open and free of ice during the winter months. However, during periods of sustained cold, ice may build up on the boulder control approximately thirty feet down stream of the gage station. This year temperatures remained relatively warm with only a few periods of noted ice.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable, except for the following dates when the gage was ice affected: December 24-25, 2009, January 9-13, February 9-13, March 20-22, 2010. The DCP missed five hourly values on February 27, 2010. The values were filled in using adjacent data and flow was estimated. The DCP also failed to log data from August 9-2, 2010. Values were estimated using the upstream gage (BOCOROCO) as a guide with consideration to diversions between the gages. The bubbler operated very well throughout the year. The visits show reasonable agreement between the bubbler and the primary reference with only one instrument correction on November 25, 2009. The correction was applied and prorated back to the last known point of agreement between gages on October 19, 2009.
Datum Corrections.--	Levels were run on October 28, 2010. No correction was needed as all elevations were within tolerance.
Rating.--	Section control is a man placed boulder weir approximately 50 feet downstream,. Another boulder control approximately 30 ft further downstream could come into play at very high flows. Cobble and boulder riffles occupy the intermediate stretch between the two controls. The channel banks are part of the control for higher stages. Rating No. 3, developed May 24, 2005 was used again this year. Rating 3 is defined by measurements to 900 cfs, based on a 2010 high measurement of 600 cfs. Fifteen measurements (Nos. 121-135) were made this year, and ranged in discharge from 9.49 to 600 cfs. They cover the range of mean daily flows experienced throughout the water year. The peak flow of 758 cfs occurred at 0230 June 7, 2010 at a gage height of 3.91 ft. with a shift of 0.12 ft. It exceeded Measurement 130, made June 8, 2010, by 0.33 feet in stage.
Discharge.--	Shifting section control method used. Shifts are caused by scour and fill of the gage pool. Measurements show shifts varying between -0.05 and 0.12 feet. All measurements were given full weight and applied, except Measurement 121 which was adjusted 5%, to smooth shift distribution. Shifts were applied as defined by measurements and distributed by time proration for the periods: Oct 1, 2009 - June 3, 2010, and June 28 – Sept 30, 2010. . Shifts were distributed by stage for the periods: June 3 – 8, 2010 using variable stage-shift relationship Table 1 based on Measurements 129-130 made during the period; and, June 8 – 28, 2010, using variable stage-shift relationship Table 2 based on Measurements 130-131 made during the period.
Special Computations.--	A spreadsheet is normally used to compare the upstream gage (BOCOROCO) with the downstream gage (BOCOBOCO) in the winter. The spreadsheet is used for BOCOROCO to estimate winter flows, and at BOCOBODO to verify change in flow events. Flows on ice affected days through the winter months were estimated from adjacent good record and in some cases rounded to the nearest 5 cfs. Computed record was sometimes used for suspected ice periods where a partial day record may be part good and part bad.
Remarks.--	Record is good, except for periods of ice affect, which are estimated and poor, and periods of missing data, which were estimated and rated fair to poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	A new rating should be developed using recent high water measurements. An air temperature sensor should be installed to assist with winter record.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOULDER CREEK AT BOULDER, CO

RATING TABLE--

BOCOBOCO03 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

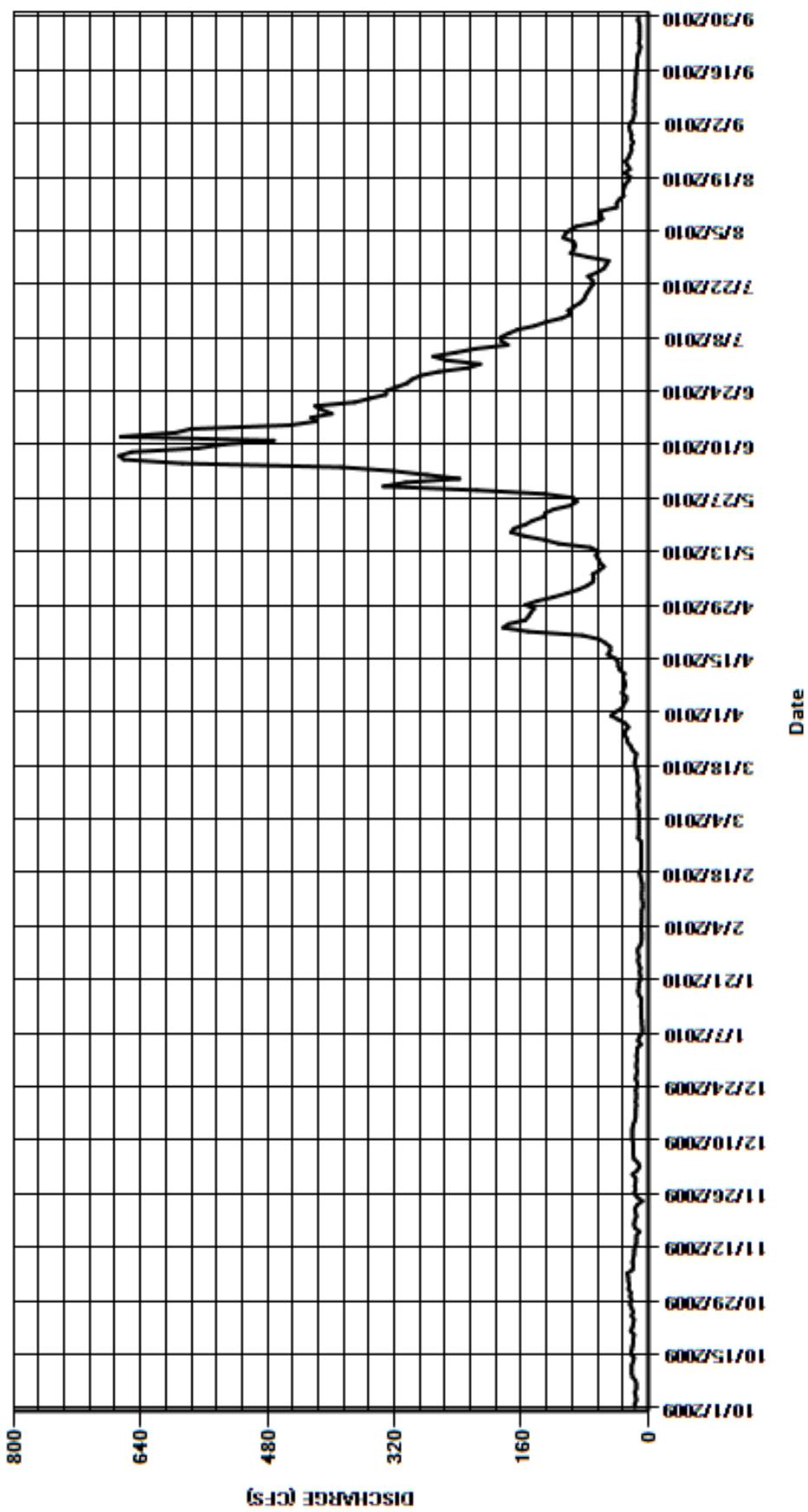
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	25	20	15	8.1	12	41	120	238	212	92	24
2	17	24	14	14	8.1	12	33	103	279	255	94	23
3	15	25	11	14	8.9	12	31	88	321	271	107	19
4	16	25	13	9.3	8.8	12	28	77	387	243	105	18
5	17	27	18	13	8.4	12	28	70	587	218	99	17
6	15	20	19	11	8.5	12	33	69	661	177	91	18
7	15	19	19	7.4	8.6	13	31	70	667	185	66	17
8	16	20	19	7.5	8.4	13	29	62	651	186	58	18
9	20	19	19	8	7	12	30	56	567	176	60	17
10	21	18	20	8	7	13	32	61	534	165	60	17
11	21	18	20	9	8	13	30	63	472	143	40	16
12	21	17	20	9	8	12	36	66	665	129	40	16
13	19	15	20	9	8	13	38	63	597	109	37	16
14	18	15	19	9.4	7.9	14	38	73	577	98	31	16
15	22	15	17	9	7.8	13	42	113	452	101	32	15
16	21	11	16	8.9	8.9	14	51	131	419	94	31	15
17	20	17	16	12	10	15	48	156	425	86	29	14
18	19	18	16	13	11	17	48	173	399	81	25	14
19	19	17	15	12	9.1	17	54	169	411	79	23	14
20	18	15	16	12	8.7	16	62	155	420	76	30	13
21	22	16	15	9.6	8.7	15	83	146	370	73	23	11
22	20	17	15	10	8.8	20	151	132	351	69	26	10
23	19	14	16	11	8.8	22	183	130	331	71	29	12
24	18	7.5	14	10	9.1	26	176	119	330	76	25	11
25	21	14	14	12	9.1	27	155	98	317	64	23	11
26	19	18	16	13	9	30	151	90	304	56	21	11
27	21	16	15	12	13	29	148	95	298	53	22	11
28	23	17	14	13	12	25	144	131	287	50	19	11
29	21	16	15	13	---	29	155	216	264	76	22	13
30	23	16	15	10	---	38	140	334	227	98	21	12
31	22	---	14	8.5	---	47	---	306	---	94	23	---
TOTAL	596	531.5	510	332.6	247.7	575	2249	3735	12808	3864	1404	450
MEAN	19.2	17.7	16.5	10.7	8.85	18.5	75	120	427	125	45.3	15
AC-FT	1180	1050	1010	660	491	1140	4460	7410	25400	7660	2780	893
MAX	23	27	20	15	13	47	183	334	667	271	107	24
MIN	15	7.5	11	7.4	7	12	28	56	227	50	19	10
CAL YR	2009	TOTAL	27511.7	MEAN	75.4	MAX	599	MIN	4.5	AC-FT	54570	
WTR YR	2010	TOTAL	27302.8	MEAN	74.8	MAX	667	MIN	7	AC-FT	54160	

MAX DISCH: 758 CFS AT 02:30 ON Jun. 07,2010 GH 3.91 FT. SHIFT 0.12 FT.

MAX GH: 3.91 FT. AT 02:30 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK AT BOULDER, CO
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
Water Year 2010

Location.--	Lat 39°56'18", long 105°20'53", NW1/4 sec. 28, T.1 S., R.71 W., Boulder County. Measures releases from Gross Reservoir; which is filled by South Boulder Creek and transmountain diversions from Moffat Tunnel.
Drainage and Period of Record.--	92.8 sq. mi. East Slope drainage (Moffat Tunnel West Slope drainage not included). Oct. 1967 to present.
Equipment.--	Graphic water stage recorder, and a Sutron Satlink Data Collection Platform (DCP) with shaft encoder in a concrete shelter and concrete well at a 25 ft. Parshall Flume. The primary reference is an electric tape gage in the gage house with a supplemental staff gage located in the flume. A foot bridge crosses the flume just above the staff location and is used for high flow measurements. Urban Drainage Flood Control District has installed a transducer in well to monitor high flows. The structure is owned and maintained by the Denver Water Department.
Hydrologic Conditions.--	Gross Reservoir is an on-stream reservoir; therefore, controlled release from Gross Reservoir as regulated by the Denver Water Department, and only partial control only when the reservoir's spillway is in use. Water retained and released by Gross Reservoir includes transmountain water conveyed from the Fraser River Basin via the Moffat Tunnel Near Rollinsville, CO (MOFTUNCO) structure as well as waters native to South Boulder Creek. Water released from Gross Reservoir into South Boulder Creek can be diverted to Denver Treatment facilities about 3 miles downstream at the South Boulder Creek Diversion (BOSDELCO) structure.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with chart record and DCP log as back up. The record is complete and reliable. Data for October 28 and 29, 2009 were taken from the DCP log since transmission failed on these days and the chart recorder batteries were dead. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 10 visits made to the gage this year. However, three instrumentation corrections were noted throughout the year ranging in magnitude from +0.01 to -0.01 feet. All corrections were applied to the record.
Datum Corrections.--	Levels were last run on September 4, 2007. No correction was indicated nor applied.
Rating.--	The control is a 25-foot Parshall Flume located in the channel about 1000 yards below the dam outlets. The condition of the structure is generally good, although the floor has some roughness that causes some velocity variations and helps moss / algal growth to get established. The flume does not have much of a stilling pool in front of the flume which can further affect performance by buildup of gravel in the approach. The flume is also susceptible to higher than expected approach velocities at higher release rates. Shifts at lower flows are due to moss buildup on the floor as well as the gradual 'aging' roughness of the floor bottom which causes variations in velocities. Shifts can be caused by approach conditions at higher stages as well. For much of this water year a sand bar has been developing just upstream of the flume on the left side of the channel and is contributing to uneven approach velocities. A standard 25-foot Parshall Flume rating was used all year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 25 ft Parshall Flume is 15 to 1660 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless these flows are further defined by measurements. Ten measurements (Nos. 674-683) were made this year ranging in discharge from 11.6 to 356 cfs. Measurements cover the range in stage experienced throughout the year. The peak flow of 486 cfs occurred at 0000 June 10, 2010 at a gage height of 2.78 ft with a shift of 0.00 ft. It which exceeded Measurement No. 681, made June 15, 2010 by 0.50 ft of stage and 130 cfs respectively.
Discharge.--	Shifting control method was used all year. Open water measurements showed shifts varying between -0.03 ft and +0.03 ft. Shifts at this structure which fall within 5% of the STD25FTP Rating have historically been adjusted to zero at the time of the measurement by agreement with Denver Water Department. This has worked for flows above about 15-20 cfs. However, flows below about 15-20 cfs seem to be susceptible to approach conditions and tend to run a small negative shift which does not zero out. For flows below about 10 cfs, the measurement history indicates that a negative shift of -0.02 or -0.03 seems to be resident in the flume. Measurement Nos. 676, 679, 680, 681, and 682 (all above about 15 cfs) were all adjusted from 1% to 3% to a zero shift. Measurement Nos. 675, 678, and 683 (all below 20 cfs) had small negative shifts which were given full weight. Shifts were distributed by time with consideration of stage during the period: October 1- November 2: For the period: November 2, 2009 to September 30, 2010, shifts were applied by stage using a variable stage shift relationship based on all measurements made during the period (Nos. 675- 683), plus Measurement 684 made in WY 2011. Flows below 10 cfs in the winter all were assigned the -0.03 ft shift by this method.
Special Computations.--	None .
Remarks.--	The record is rated good except periods when the average daily flow fell below 15 cfs and which were not defined by measurements are considered fair. This record will be directly used to estimate winter flows at the South Boulder Creek At Eldorado Springs (BOCESLCO) gage. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The flume is susceptible to moss growth throughout the year. Frequent cleaning is needed to insure no affect to gage height. Better documentation of Denver Water staff's daily visits to the gage is requested. Also, the operator should be consulted to find out if release was completely constant during any ice periods. If so, any ice record can be estimated without loss of accuracy using prior and subsequent discharges. The gravel bar developing upstream of the flume should be watched for further impact on the flume's performance. Removal and deepening of the stilling pool upstream of the flume is highly recommended.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR

RATING TABLE--

STD25FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

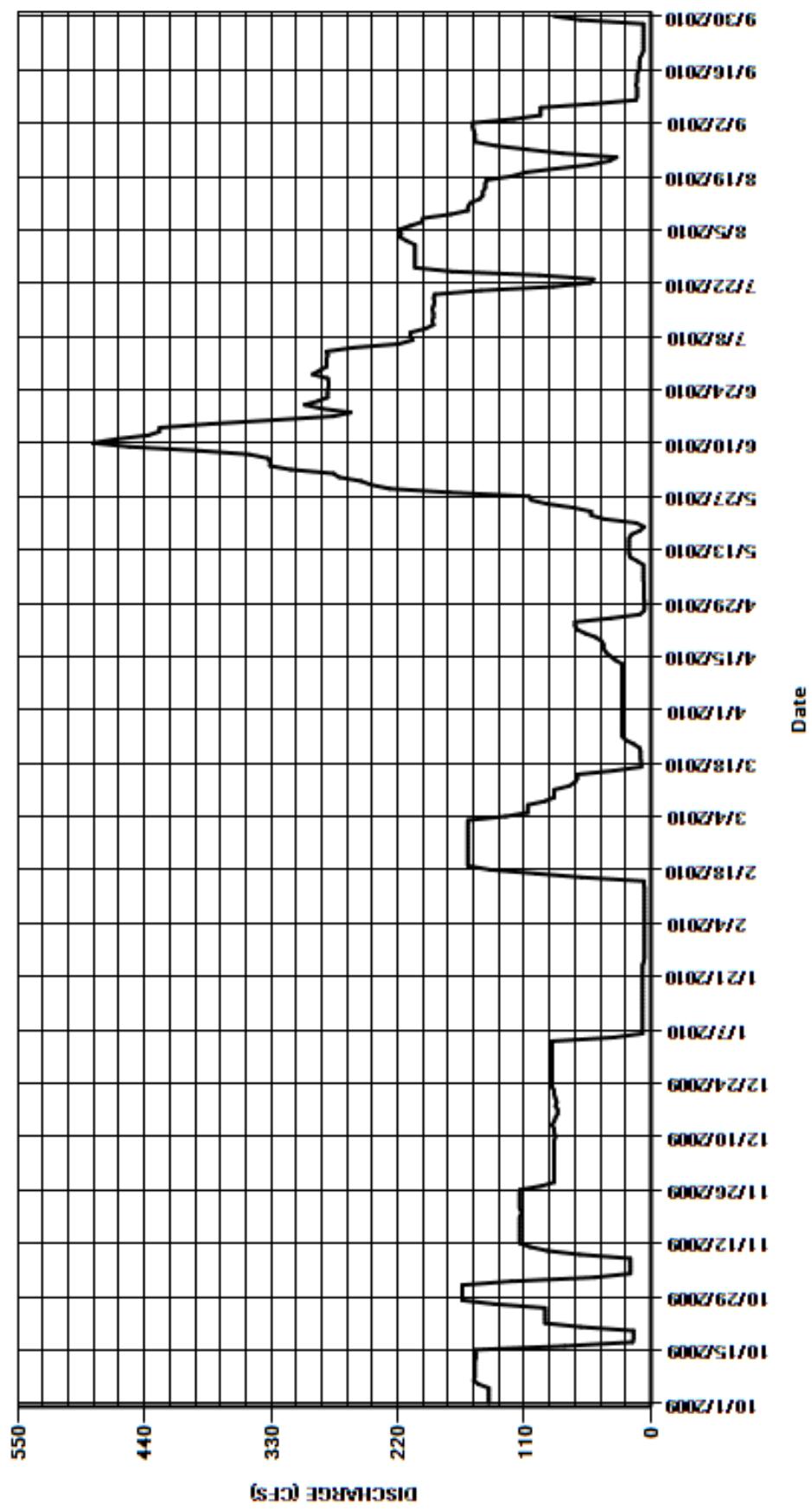
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	141	164	84	86	5.6	159	25	6.1	271	282	205	155
2	141	121	84	86	5.6	159	25	6.1	276	282	212	155
3	141	49	84	86	5.6	159	25	6.1	313	281	218	119
4	141	18	84	86	5.6	126	25	6.1	331	282	217	96
5	141	18	84	32	5.6	107	25	6.6	331	259	219	96
6	150	18	84	7.2	5.6	107	25	6.6	333	219	209	96
7	154	18	84	7.2	5.6	107	25	6.6	349	207	199	50
8	153	18	84	7.2	5.6	92	25	6.6	394	209	198	13
9	153	62	84	7.2	5.6	84	25	6.6	453	209	174	12
10	153	90	83	7.2	5.6	84	25	12	485	196	159	12
11	153	105	84	7.2	5.6	84	25	18	465	189	159	12
12	153	114	84	7.2	5.6	71	25	19	437	190	157	13
13	152	114	86	7.2	5.6	66	25	19	427	189	149	12
14	152	114	84	7.2	6	64	31	19	427	189	146	12
15	154	114	83	7.2	6.1	64	35	19	383	190	146	12
16	75	114	81	7.2	60	32	39	19	329	189	144	10
17	16	114	81	7.2	100	8.4	41	17	276	188	144	10
18	15	114	83	7.2	140	8.5	41	9.5	261	189	143	9.9
19	15	114	82	7.2	159	9	43	5.8	286	188	121	9.7
20	15	112	83	7.2	159	9	48	13	301	148	109	7.8
21	61	114	84	7.2	159	9	57	40	289	85	82	6.6
22	92	114	84	7.2	159	10	64	52	281	53	53	6.6
23	92	114	86	7.2	159	15	66	52	281	50	36	6.7
24	92	114	86	7.2	159	22	66	67	281	97	30	6.6
25	92	114	86	6.2	159	25	35	90	280	173	77	6.6
26	92	114	86	5.6	159	25	9.7	104	280	205	107	6.6
27	136	95	86	5.6	159	25	5.9	106	281	205	135	6.6
28	164	84	86	5.6	159	25	5.6	175	294	205	153	6.6
29	164	84	86	5.6	---	25	5.8	227	288	205	153	61
30	164	84	86	5.6	---	25	5.9	243	282	205	153	84
31	164	---	86	5.6	---	25	---	252	---	205	154	---
TOTAL	3681	2736	2612	552.6	1974.9	1830.9	923.9	1635.7	9965	5963	4561	1110.3
MEAN	119	91.2	84.3	17.8	70.5	59.1	30.8	52.8	332	192	147	37
AC-FT	7300	5430	5180	1100	3920	3630	1830	3240	19770	11830	9050	2200
MAX	164	164	86	86	159	159	66	252	485	282	219	155
MIN	15	18	81	5.6	5.6	8.4	5.6	5.8	261	50	30	6.6
CAL YR	2009	TOTAL	48545.2	MEAN	133	MAX	413	MIN	6.1	AC-FT	96290	
WTR YR	2010	TOTAL	37546.3	MEAN	103	MAX	485	MIN	5.6	AC-FT	74470	

MAX DISCH: 486 CFS AT 00:00 ON Jun. 10,2010 GH 2.78 FT. SHIFT 0 FT.

MAX GH: 2.78 FT. AT 00:00 ON Jun. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
Water Year 2010

Location.--	Lat 39°55'58", long 105°18'29", SW¼ sec. 26, T.1 S., R.71 W., Boulder County. Diverts Denver Water Dept. rights released from Gross Reservoir to South Boulder Creek.
Drainage and Period of Record.--	N/A. Oct. 1958 to present.
Equipment.--	Weekly graphic water stage recorder and satellite monitoring in a timber shelter and concrete well. An electric tape is used to reference the gage, with a supplemental outside staff. The station is maintained by the Denver Water Department.
Hydrologic Conditions.--	Controlled diversion of water released from Gross Reservoir, about 3 miles upstream, to Ralston Reservoir for municipal use. The diversion is the delivery point for west slope water diverted through Moffat Tunnel. Municipal diversions of 5-10 cfs are made downstream. Accurate measurement at this gage is important to insure that the proper amount of water passes to the downstream users. A transitory peak often occurs prior to a shut down as the canal is used to help drain the diversion pool.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from satellite monitoring with chart back up. Primary record agreed with the recorder data within 0.02 foot. The record is complete and reliable. The diversion was off or only producing trickle flows on the following days: Oct. 17–20, Nov. 4–8, 2009 , Jan. 6–Feb. 15, Mar. 17–May 27, July 22–23, Aug. 24, Sept. 8 – 28, 2010 Trickle flow (GH's less than 0.04 ft.) was zeroed out by setting the primary data import function to convert all GH's of 0.04 or less to zero. Thus the primary data shows zero for periods when the GH graphs show slightly above zero.
Datum Corrections.--	Levels were last run November 14, 2006 across the flume crest. No corrections were necessary.
Rating.--	Control is a 12 foot Parshall Flume. Positive or negative shifts can be caused by approach conditions, particularly at high flows. A large timber is hung in the canal upstream to damp the flow from the headgate. Moss can become a factor if the diversion runs for a long period. A standard 12 foot Parshall Flume rating was used all year. It is defined for all ranges of flow experienced. Historically the shifts to the rating at higher flows (300 cfs range) seem to justify a non-standard rating. Flows did not get above 200 cfs for the 2010 Water Year. Three measurements (Nos. 367-369) were made this water year, ranging in discharge between 75.3 and 105 cfs. The peak flow of 176 cfs occurred at 1515 June 9, 2010 at a gage height of 2.29 ft with a shift of 0.00 ft. It exceeded measurement No. 368 (made on June 24, 2010), by 0.68 ft. in stage.
Discharge.--	Shifting control method was used. Measurements showed unadjusted shifts ranged from -0.04 to 0.05 ft. Per agreement with Denver Water Department, shifts are adjusted to 0.00 ft and the rating is applied directly to the gage height record to compute discharge. Measurement Nos. 367 – 369 were discounted up to 5% to a zero shift.
Special Computations.--	Zero flow periods are verified against Denver Water Department Operations spreadsheets. Comparison of daily flows must take into account that it appears that Denver's daily flows are computed from noon on the accounting day to noon the next day.
Remarks.--	The record is good. Trickle flows under the diversion gate were zeroed out per agreement with Denver Water Department. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Included in the record is a mass balance between BOCBGRCO, BOCELSCO, & BOSDELCO. There have been some inconsistencies (in past measurements) in the way depths and widths are being taken. Using a single average depth for a measurement does not yield results that are defensibly more accurate than the basic flume table. Individual depths need to be taken in each section rather than averaging depths for the entire cross section. Potential inaccuracies are seen on the DMS in the differences recorded in areas for comparable GH measurements. When moss is observed and a negative shift is measured which supports a moss effect, the water commissioner should be notified. Depending on his input, Denver may be requested to clean the flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	126	150	77	76	0	151	0	0	75	121	151	131
2	126	108	77	76	0	151	0	0	75	121	151	132
3	126	37	77	76	0	151	0	0	103	121	151	99
4	126	0	78	76	0	121	0	0	121	121	147	76
5	126	0	79	34	0	99	0	0	121	98	142	77
6	135	0	80	0	0	99	0	0	121	80	129	77
7	141	0	80	0	0	99	0	0	121	80	121	38
8	141	0	79	0	0	85	0	0	127	80	121	0
9	141	40	79	0	0	76	0	0	151	80	115	0
10	141	77	79	0	0	76	0	0	174	80	110	0
11	141	90	79	0	0	76	0	0	159	80	110	0
12	141	100	79	0	0	64	0	0	137	85	110	0
13	141	100	79	0	0	55	0	0	89	94	106	0
14	141	100	77	0	0	55	0	0	42	98	111	0
15	141	100	76	0	0	55	0	0	30	98	115	0
16	68	100	76	0	39	33	0	0	33	105	114	0
17	0	101	76	0	90	0	0	0	30	113	110	0
18	0	101	76	0	127	0	0	0	30	115	108	0
19	0	101	75	0	150	0	0	0	53	115	90	0
20	0	103	75	0	150	0	0	0	70	82	76	0
21	38	104	75	0	150	0	0	0	76	24	52	0
22	76	104	76	0	150	0	0	0	86	0	23	0
23	76	104	76	0	150	0	0	0	96	0	6.6	0
24	76	104	76	0	150	0	0	0	100	42	0	0
25	76	105	76	0	150	0	0	0	113	117	39	0
26	78	106	76	0	150	0	0	0	122	151	78	0
27	117	90	76	0	150	0	0	0	121	151	104	0
28	150	77	76	0	150	0	0	47	109	151	123	0
29	150	77	76	0	---	0	0	75	100	151	123	43
30	150	77	76	0	---	0	0	75	112	151	123	76
31	150	---	75	0	---	0	---	75	---	151	126	---
TOTAL	3239.00	2356.00	2387	338.00	1756.00	1446.00	0.00	272.00	2897	3056.00	3185.60	749.00
MEAN	104	78.5	77	10.9	62.7	46.6	0	8.77	96.6	98.6	103	25
AC-FT	6420	4670	4730	670	3480	2870	0	540	5750	6060	6320	1490
MAX	150	150	80	76	150	151	0	75	174	151	151	132
MIN	0	0	75	0	0	0	0	0	30	0	0	0

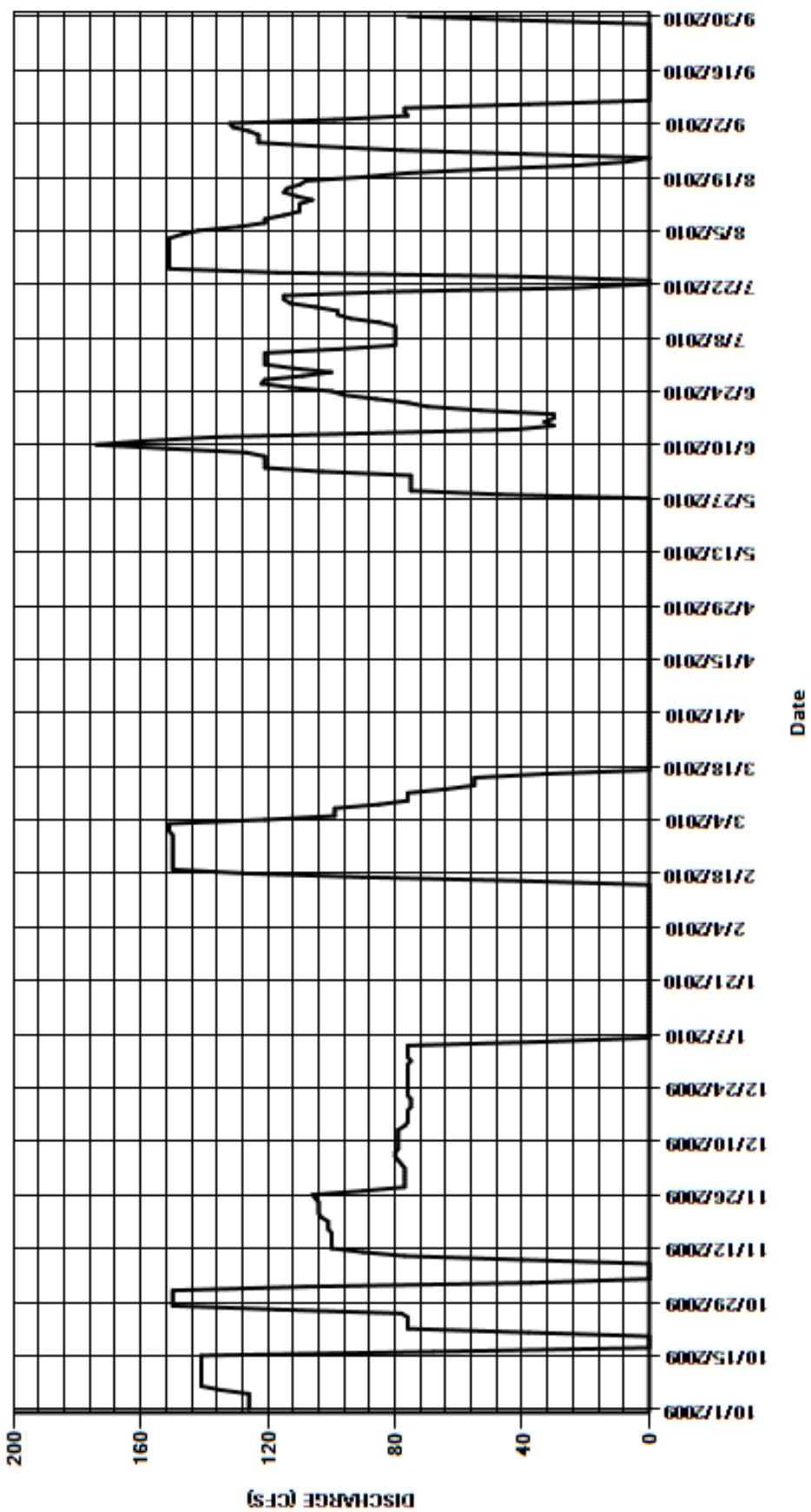
CAL YR	2009	TOTAL	28494.00	MEAN	78.1	MAX	281	MIN	0	AC-FT	56520
WTR YR	2010	TOTAL	21681.60	MEAN	59.4	MAX	174	MIN	0	AC-FT	43010

MAX DISCH: 176 CFS AT 15:15 ON Jun. 09,2010 GH 2.29 FT. SHIFT 0 FT.

MAX GH: 2.29 FT. AT 15:15 ON Jun. 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
Water Year 2010

Location.--	Lat. 39°55'52", Long. 105°17'43", in SE $\frac{1}{4}$ sec. 26, T.I S., R.71 W., Boulder County, Hydrologic Unit 10190005, on left bank 0.2 mi downstream from South Draw, 1.0 mi west of Eldorado Springs, 1.8 mi downstream from South Boulder diversion canal, 5.0 mi south of Boulder, and 6.7 mi downstream from Gross Reservoir.
Drainage and Period of Record.--	109 mi ² . Apr. 1888-Oct. 1892, May 1895-Sept. 1901, Aug. 1904 to present.
Equipment.--	Graphic water stage recorder and Sutron High Data Rate (HDR) satellite monitoring DCP in metal box shelter and corrugated metal pipe well. Supplemental outside chain gage. Urban Drainage and Flood Control District operates a pressure transducer and LOS radio transmitter.
Hydrologic Conditions.--	Flows have been regulated since May 1, 1995, by Gross Reservoir (capacity 43,060 acre-ft) 6.7 miles above station. Channel is composed of embedded small boulders, rock and gravel. Low and medium water control are large boulders ten feet below gage. The stream banks are the control at high stages. Channel is straight for 200 ft upstream and 15 ft below gage before a bend in the river occurs. Banks are lined with willows and other vegetation, but private land and State Park land is quite manicured. The drainage area consists of mountainous forested terrain. The reach is controlled most of the time. High snow runoff is intercepted by Gross Reservoir, about 3-4 miles upstream. Release from Gross is recorded at gage below Gross Reservoir (BOCBGRCO). However, most of this release is taken out above the Eldorado Springs gage at Denver's Diversion to Ralston Reservoir (BOSDELCO). There is about 15 sq mi of drainage between Gross Reservoir and the gage. During conditions when there is low snow melting or storm runoff, significant flows can be seen at the gage when Gross release has been curtailed to minimum.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data, with chart record and the DCP log as backup. The record is complete and reliable, except for the following periods: December 3, 2009, when the gage was affected by ice; December 4, 2009—April 12, 2010, when the gage was turned off for winter season; April 13, 2010, partial day as gage was turned back on after winter season. Missing primary data due to missed transmissions on October 27-29, and August 28-30 were filled from backup data without loss of accuracy.
Datum Corrections.--	Levels were last run on August 16, 2006. No correction was necessary at that time.
Rating.--	Control for low and medium flows is a rock and concrete core dam with hand placed rock on top about 10 feet below the gage. High water control is rock dam and stream banks. The dam is deteriorating. Rating No. 23 was used for the entire water year. No. 23 has been in use since May 23, 2003 and is defined by measurements to 555 cfs. Fourteen measurements (Nos. 492-505) were made this year ranging in discharge from 6.23 to 488 cfs. Measurements cover the discharge range experienced for the entire year. The peak flow of 518 cfs occurred at 0215 June 15, 2010 at a gage height of 3.15 ft with a shift of 0.14 ft. It exceeded high water Measurement 499, made June 14, 2010, by 0.05 ft. in stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation of rocks in the channel and by the gradual deterioration of the rocks piled up that act as the control. Measurements showed unadjusted shifts ranging between -0.10 and 0.14 ft. All measurements were given full weight. Shifts were applied by time proration for the periods April 13—May 19, 2010 and July 7—Sept. 30, 2010. Shifts were distributed by stage for the periods: Oct 1- December 3, 2009 using variable stage-shift relationship BOCELS COVST01, the same variable shift table that ended WY2009, and based on Measurements 488-492 made during the period; and May 19 – July 7, 2010 (the peak flow period for the WY) using variable stage-shift relationship BOCELS COVST02, based on Measurements 497 thru 501 made during the period of use.
Special Computations.--	A spreadsheet was used to estimate flows at BOCELS CO during ice affected periods and periods of no winter record by taking the release from Gross Reservoir (BOCBGRCO) and subtracting out Denver's diversion to Ralston Reservoir (BOSDELCO). Reasonable consistency is seen between the mass balance estimates and periods of good record at this gage, except during periods when the diversion pool is filling. Max/min temperatures from Gross Reservoir and 3 winter measurements made during the winter period were also included in the spreadsheet.
Remarks.--	The record is good, except for periods of ice effect and no gage height record, which were estimated and are considered poor. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The channel and station have deteriorated over the last few years. A new station was constructed in the 2010 and is located upstream approximately 1.4 miles. The current gage will be discontinued after the 2010 Water Year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS

RATING TABLE--

BOCELSCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

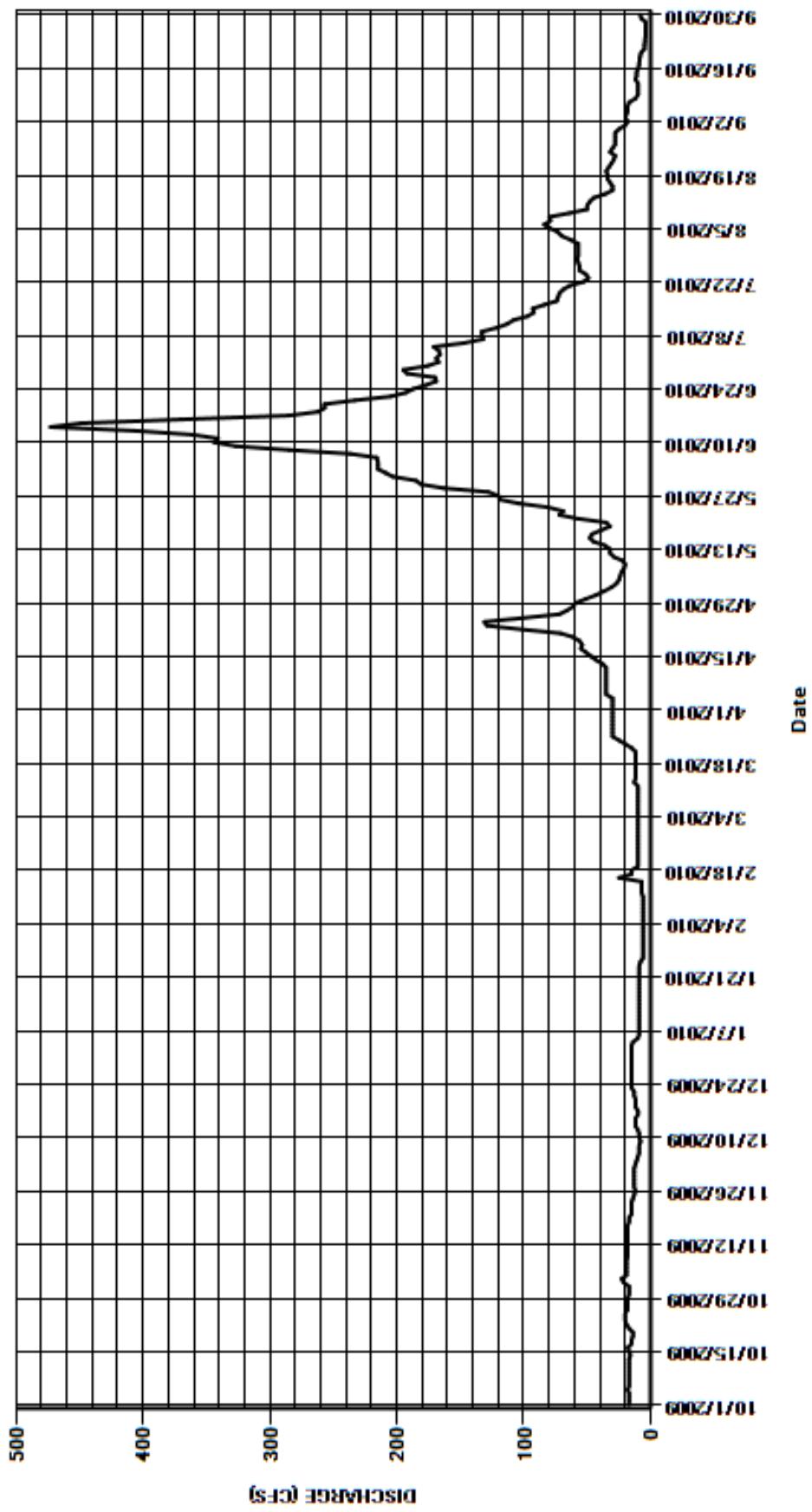
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	17	13	15	6	10	30	43	203	167	57	20
2	17	21	13	15	6	10	30	37	209	169	63	18
3	17	23	12	15	6	10	30	31	215	166	70	20
4	17	19	11	14	6	10	30	27	215	167	73	19
5	18	19	10	10	6	10	35	25	215	171	79	18
6	17	19	9	9	6	10	35	24	216	147	84	18
7	17	19	9	9	6	10	35	23	237	132	79	17
8	17	19	9	9	6	10	35	21	285	133	80	12
9	17	18	8	9	6	10	35	20	327	133	64	10
10	17	18	9	9	6	10	35	22	344	121	50	10
11	17	18	9	9	6	10	35	29	341	113	50	10
12	17	18	10	9	7	10	35	32	361	108	48	10
13	17	18	12	9	7	13	38	32	406	97	45	12
14	16	18	12	9	7	12	43	36	473	92	36	11
15	17	18	12	9	7	12	47	45	449	93	30	11
16	18	18	10	9	25	12	51	48	370	84	30	9.6
17	15	18	10	9	15	12	55	46	285	74	32	9.1
18	15	17	12	9	15	12	54	39	262	73	34	8.8
19	14	17	12	9	10	12	56	32	257	72	34	8.3
20	14	15	12	9	10	12	61	35	257	69	35	7.6
21	17	15	13	9	10	12	71	57	233	64	33	4.9
22	19	15	13	9	10	15	101	72	205	53	31	4.8
23	20	15	15	9	10	20	129	69	193	49	29	4.4
24	20	14	15	9	10	25	131	81	187	51	28	4.2
25	20	13	15	8	10	30	101	104	177	56	32	4.1
26	18	12	15	6	10	30	72	119	169	56	30	3.8
27	18	13	15	6	10	30	66	120	170	57	28	3.8
28	18	13	15	6	10	30	61	128	192	58	28	3.8
29	18	13	15	6	---	30	59	163	195	57	28	7.4
30	17	13	15	6	---	30	51	181	176	57	28	8.3
31	17	---	15	6	---	30	---	185	---	57	25	---
TOTAL	533	503	375.0	284.0	249.0	499	1647	1926	7824	2996	1393	308.9
MEAN	17.2	16.8	12.1	9.16	8.89	16.1	54.9	62.1	261	96.6	44.9	10.3
AC-FT	1060	998	744	563	494	990	3270	3820	15520	5940	2760	613
MAX	20	23	15	15	25	30	131	185	473	171	84	20
MIN	14	12	8	6	6	10	30	20	169	49	25	3.8
CAL YR	2009	TOTAL	21000.7	MEAN	57.5	MAX	348	MIN	6	AC-FT	41650	
WTR YR	2010	TOTAL	18537.9	MEAN	50.8	MAX	473	MIN	3.8	AC-FT	36770	

MAX DISCH: 518 CFS AT 02:15 ON Jun. 15,2010 GH 3.15 FT. SHIFT 0.14 FT.

MAX GH: 3.15 FT. AT 02:15 ON Jun. 15,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06730300 COAL CREEK NEAR PLAINVIEW
Water Year 2010

Location.--	Lat 39°52'40", long 105°16'39" (Eldorado Springs Quad. 1965, 1:24,000 scale) in SE1/4, NE1/4, Sec. 13, T. 2S, R. 71W, Jefferson County, on left bank 100 ft upstream from culvert on State Hwy 72, 1.2 miles south of Plainview, 5 miles downstream from Beaver Creek and 9 miles north of Golden, CO.
Drainage and Period of Record.--	15.1 mi ² ; 1959 to present.
Equipment.--	Graphic water-stage recorder, Sutron shaft encoder and a Sutron Satlink Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter. The base gage is a metal drop tape with adjustable Reference Point (RP) mounted on the instrument shelf with a supplemental outside staff gage located 2.5 feet downstream of the shelter. The outside staff was damaged by equipment and removed on Oct. 21, 2009. A Cantilever type staff gage was installed on Sept. 21, 2010. Levels need to be run to make the Cantilever Gage fully operational. The control is a low-head concrete dam constructed with a pipe through the control to allow for better bucket measurement during low flow conditions. The pipe is plugged when measurement by bucket is not occurring.
Hydrologic Conditions.--	Drainage area consists mainly of forested mountainous terrain. The gage is located at the mouth of Coal Creek Canyon which has several small developments along the banks of Coal Creek. Gage is subject to rapid increases in stage resulting from rain events and runoff from hardened areas through the canyon. The channel is straight for approximately 100 feet upstream and approximately 100 feet downstream of the station. The stream is constrained to one channel at all stages. Due to pipeline construction just upstream of the gage in 2008, the channel had been collecting loose gravel left by the equipment. The channel was cleaned out after the beginning of the Water Year on October 21, 2009. Since the clean-out, shifts have been stable and reliable.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with chart record as backup. The record is complete and reliable, except for: December 2-4, 19, 24-26, when the gage was ice affected; January 6-13, 2010 when there was ice in well or inlets and the well apparently drained. The entire period December 5—February 24 was possibly ice affected. On October 27, 2009, July 16, 26, August 26, September 19, 2010, the DCP missed single hourly values. Missing values were replaced from chart record without loss in accuracy. On July 7, 2010 the shaft encoder was adjusted back to the primary reference. This equipment adjustment was applied as a correction back to a point of matching data, in this case, the previous measurement.
Datum Corrections.--	Levels were last run on October 14, 2009. No correction was necessary at that time. RP was found to be correct using RM 1, but 0.01 ft high with respect to RM 4. RM elevations may be re-established in the future
Rating.--	The control is a rock and concrete dam eleven feet below the gage. Rating Number 10, new this year, was developed from WY 2010 measurements and is defined by measurements from 0.01 to 62 cfs. Twelve measurements (897 – 908) were made this water year ranging in discharge from 0.01 to 62 cfs. Measurement No. 908 (0.01 cfs) was performed using a timed volumetric (bucket) methodology. All other measurements were performed using traditional current meter methods. The peak flow of 78.2 cfs occurred at 1500 April 29, 2010 at a gage height of 1.75 ft with a shift of -0.01 feet.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation of material on the control. Measurements showed unadjusted shifts ranging from -0.01 to 0.00 feet. Shifts were applied strictly by time between measurements. All measurements were given full weight, except for No. 900 which was discounted 5% to smooth distribution; and Nos. 901-902 which were adjusted +/- 2% to the same value since they were made at the same time. Special distribution occurred during the following period Oct. 1 – 21, 2009. Meas. No. 897 was made immediately after the channel was excavated on Oct. 21. Gage heights and shifts were computed for No 897 for conditions before the work (0.39, -0.08) and after the work (0.32, -0.01). The -0.08 ft shift was prorated back to Oct. 1, while the -0.01 ft was pro-rated forward in time. The Oct. 1 shift was estimated to be -0.09 ft since a -0.13 shift was computed for No. 896 (made Aug 21, 2009) based on Rtg. 10.
Special Computations.--	Discharges for ice affected periods were estimated from adjacent periods of good record with consideration of temperature trends. Discharge for December 24-26 was estimated by comparison to the period January 3-5 which had similar record pattern, but did not appear to be ice affected. The pattern involved an apparently man-made release to the stream, which occurred many times throughout the winter. Apparent releases began and ended at the same time and were of similar magnitudes.
Remarks.--	Record is rated good, except for periods of ice effect, which are estimated and poor. The period December 5 to February 24 is rated fair due to possible ice effect. Station maintained and record developed by Patrick Tyler.
Recommendations.--	High water measurements should be pursued, as most of the year's flow will occur during the peak event periods. The channel was cleaned out on Oct. 21, 2009. Hydrographer should be diligent on the removal of gravel as it comes into the stilling pool and collects on the control. Levels should be run again to finalize the installation of the Cantilever Gage. PZF on the control should be verified, and the MSL elevation from the temporary RM established by the 2008 pipeline contractor should be transferred to one of our RM's. The source of the apparent releases being made to the Creek should be investigated, and any flow records available should be obtained.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06730300 COAL CREEK NEAR PLAINVIEW

RATING TABLE--

COCREPCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.23	4.6	1.5	0.62	0.89	0.53	21	50	9.2	3.9	0.48	0.02
2	0.25	4.6	1.3	0.62	1	0.57	18	40	8.3	6	0.72	0.02
3	0.28	4	1.3	0.61	0.51	0.67	15	33	7.7	5.2	0.94	0.02
4	0.3	3.7	1	1.2	0.8	0.7	13	29	7	4.5	0.64	0.01
5	0.36	3.4	1.2	0.58	1.1	0.68	13	25	6.2	5.1	0.72	0
6	0.48	3.4	1.2	0.6	0.71	0.72	13	24	5.6	3.6	0.59	0
7	0.42	3.2	1.1	0.5	0.55	0.91	12	24	5.2	4.2	0.85	0
8	0.41	3	1.1	0.5	0.58	1	12	22	4.9	4.1	0.52	0
9	0.44	2.8	1.1	0.5	0.48	0.91	12	20	4.6	3.5	0.61	0
10	0.44	2.6	1.1	0.5	0.51	0.92	13	20	4.3	3	0.67	0
11	0.46	2.3	1	0.5	0.38	0.89	14	20	5.9	2.6	0.41	0
12	0.45	2.2	0.97	0.5	0.51	1.7	16	20	19	2.2	0.33	0
13	0.48	2.2	0.97	0.5	0.48	1.1	19	18	27	1.8	0.29	0
14	0.46	2.1	0.93	0.53	0.58	1.3	19	22	38	1.4	0.25	0
15	0.44	1.7	0.85	0.52	0.45	1.3	20	31	34	1.4	0.22	0
16	0.44	1.9	0.82	0.53	0.42	1.6	21	32	27	1.1	0.25	0
17	0.43	2.2	0.83	0.53	0.43	2.1	21	35	22	0.9	0.23	0
18	0.42	2.6	0.78	0.52	0.48	2.4	21	36	18	0.88	0.15	0
19	0.4	2.7	0.8	0.52	0.48	3.9	20	37	16	0.97	0.13	0
20	0.41	2.5	0.81	0.5	0.47	6.7	20	35	14	0.95	0.1	0
21	0.43	2.4	0.76	0.57	0.42	5	22	32	12	1.1	0.09	0
22	0.44	2.3	0.76	0.53	0.44	8.3	52	29	11	0.79	0.07	0
23	0.44	2	0.98	0.66	0.48	9.4	61	26	9.2	0.64	0.06	0
24	0.42	1.8	0.8	1.2	0.48	9.6	58	22	8.3	0.55	0.07	0
25	0.47	2.1	1.3	0.58	0.45	11	58	19	7.2	0.56	0.06	0
26	0.48	1.9	0.7	1.4	0.47	12	64	17	6.8	0.48	0.07	0
27	0.5	1.8	0.66	0.51	0.53	10	61	15	6.6	0.45	0.05	0
28	0.54	1.7	0.63	0.53	0.52	10	67	13	5.6	0.69	0.05	0
29	0.61	1.6	0.65	0.57	---	13	75	12	4.9	0.78	0.04	0
30	0.96	1.5	0.63	0.95	---	18	64	12	4.4	0.88	0.04	0
31	2	---	0.62	0.58	---	24	---	10	---	0.55	0.03	---
TOTAL	15.29	76.8	29.15	19.46	15.60	160.90	915	780	359.9	64.77	9.73	0.07
MEAN	0.49	2.56	0.94	0.63	0.56	5.19	30.5	25.2	12	2.09	0.31	0.002
AC-FT	30	152	58	39	31	319	1810	1550	714	128	19	0.1
MAX	2	4.6	1.5	1.4	1.1	24	75	50	38	6	0.94	0.02
MIN	0.23	1.5	0.62	0.5	0.38	0.53	12	10	4.3	0.45	0.03	0

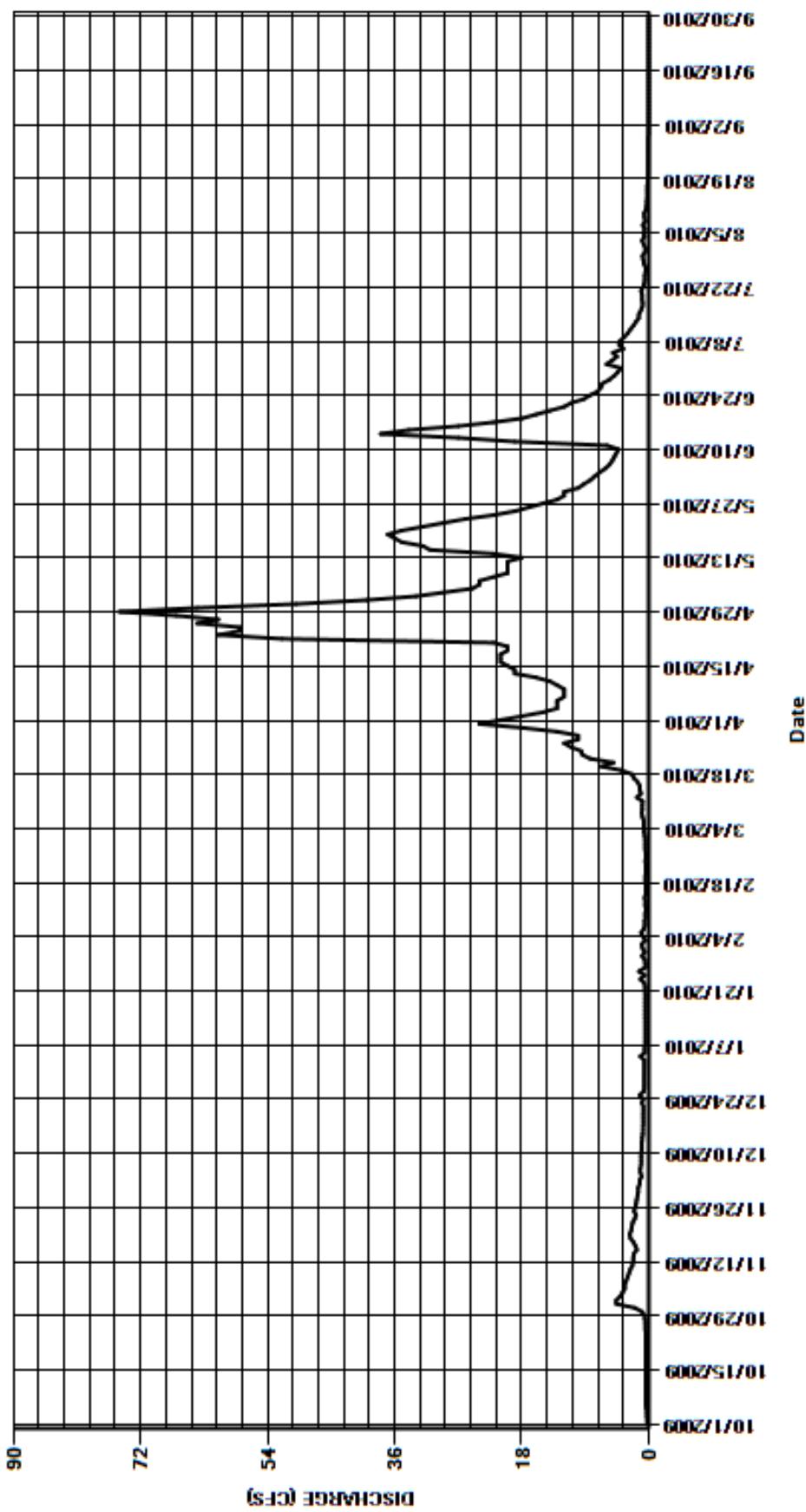
CAL YR	2009	TOTAL	1908.83	MEAN	5.23	MAX	96	MIN	0	AC-FT	3790
WTR YR	2010	TOTAL	2446.67	MEAN	6.7	MAX	75	MIN	0	AC-FT	4850

MAX DISCH: 78.2 CFS AT 15:00 ON Apr 29,2010 GH 1.75 FT. SHIFT -0.01 FT.

MAX GH: 1.75 FT. AT 15:00 ON Apr 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06730300 COAL CREEK NEAR PLAINVIEW
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
Water Year 2010

Location.-- Lat. $40^{\circ}15'29''$, Long. $104^{\circ}52'45''$, in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, T,3 N., R.67 W., Weld County, Hydrologic Unit 10190005, on right bank 140 ft downstream from bridge on county road, 1.3 mi upstream from mouth, and 4.2 mi northwest of Platteville.

Drainage and Period of Record.-- 976 mi². 1927 to present.

Equipment.-- Graphical water-stage recorder, Sutron Model 8210 Data Collection Platform (DCP) with HDR GOES Radio and shaft encoder in a 54 inch metal pipe shelter and well equipped with inlet flushing provisions. The primary reference is an Electric Tape Gage (ETG), located inside the shelter. No usable outside staff gage.

Hydrologic Conditions.-- Drainage area from the Saint Vrain Creek and Boulder Creek drainage basins. The channel substrate is composed mainly of sand and clays downstream of many agricultural and municipal diversions. Several inflows occur upstream of the gage. A county bridge located approximately 100 feet upstream of the gage does affect flows at all stages and has fostered the development of a sand bar at the gage location.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered data with chart record as backup. The record is complete and reliable, except as follows when the gage-height was affected by ice: October 31, November 16, December 5 – 15, 24 – 31, 2009, January 1–16, 24–29, 2010. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration is supported by 19 logged visits made to the gage this year. One SE correction of -0.02 ft was applied for 2 days.

Datum Corrections.-- Levels were not run this water year. Levels were last run on May 14, 2007 to the inside gage (ET index) using RM 3 as base. No corrections were made as the ETG index was found to be within allowable tolerances.

Rating.-- Control is a sand channel with well-defined banks. The bridge above the gage has straightened the flow and is causing sand bars at the gage and downstream of the center abutment. Shifts are caused by scour and fill. In the past the rating has been affected by bank stabilization activities by the landowner on the far bank. New Rating No. 30 was created and used for the entire water year. It is defined by measurements from 33 to 2180 cfs. Fourteen measurements (Nos. 944-957) were made this year ranging in discharge from 133 to 2180 cfs. Measurements made this water year cover the range in stage except for higher mean daily flows on June 13-15, 2010 and lower mean daily flows on December 9; January 7, 8; February 15-18; March 6-23; April 2-5, 13-20; July 18-20, 23, 27, 28; September 3, 4, 6-9, 27-30. The peak flow of 3100 cfs occurred at 1815 June 13, 2010 at a gage height of 8.21 ft with a shift of 0.00 ft. It exceeded the highest Measurement Number 951, made on June 15, 2010, by 0.49 feet.

Discharge.-- Shifting control method was used. The movement of sand through the control area of the gage causes shifting away from the rating. Fill and scour of sand are typically rain event or run-off driven. Measurements showed unadjusted shifts ranged from -0.07 to +0.23 feet. The largest positive shift of +0.23 (Measurement 956) was made after a period of long sustained high flows which scoured the channel. Shifts were distributed by time proration with consideration to stage before and during the peak period. Measurement 956 was adjusted 1% to better fit shift distribution during this period. Shift change from measurement 951 (June 15, 0.00) to measurement 652 (June 30, +0.18) was handled by time since the stage change was fairly linear over time and stage-shift relationship was poorly defined.

Special Computations.-- Flows during periods of ice effect were estimated using temperature records, partial day good record and good record before and after ice effect. A digital hydrograph was used.

Remarks.-- The record is good, except the following ice-affected days: October 31, fair; November 16, poor; December 5 – 15, 24 – 31, poor; January 1-2, poor; January 3-6, fair; January 7-16, poor; January 24-29, fair. The following low flow days are rated fair due to lack of confirming measurements: March 14-18. Station maintained and record developed by Lee Cunning .

Recommendations.-- More measurements would be desirable especially at higher stages (above 3.00 feet of stage). Identify the high water controlling feature. More visits would be helpful in the winter to evaluate ice conditions.

STATE OF COLORADO
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06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO

RATING TABLE--

SVCPLACO030 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

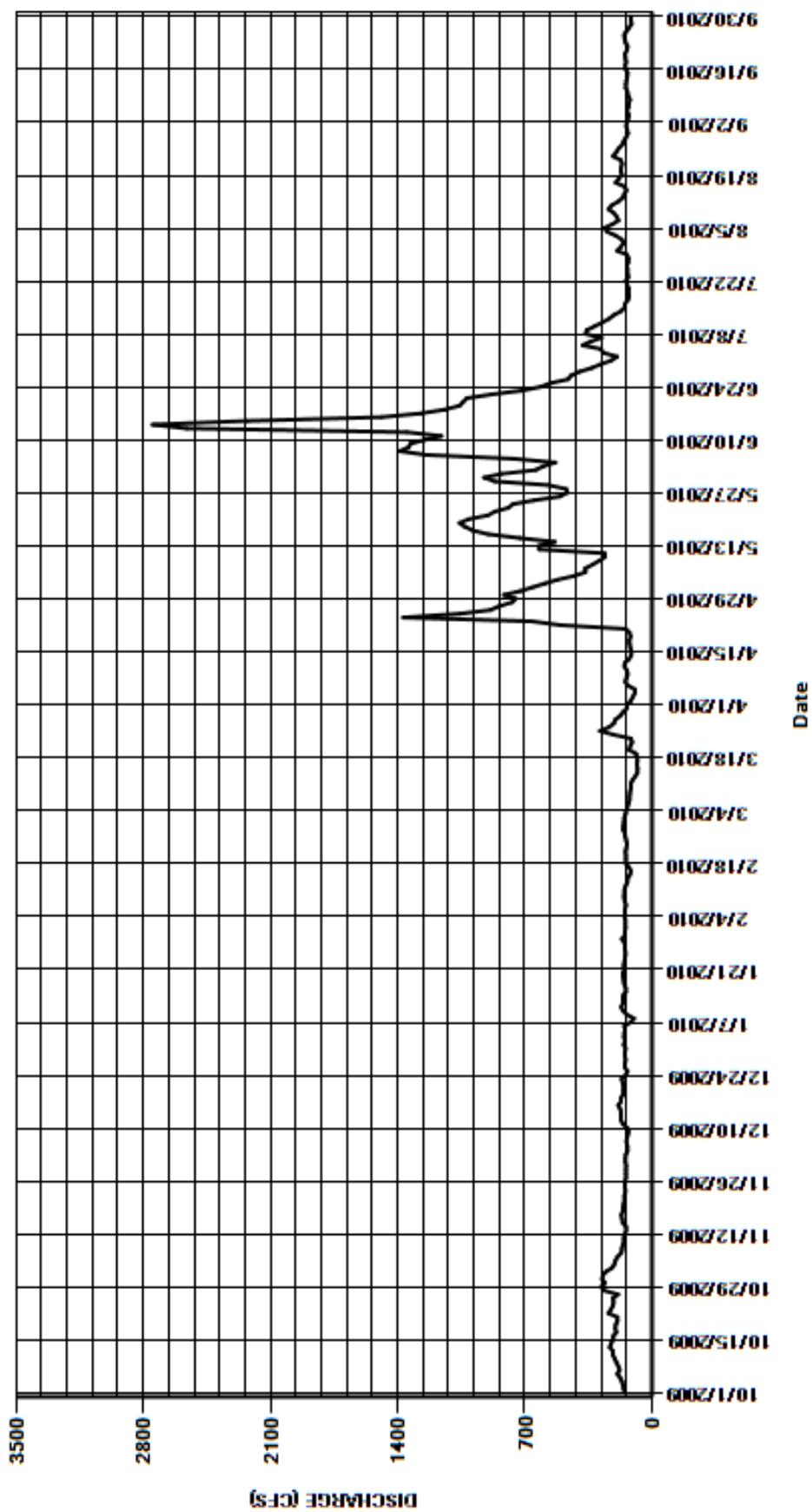
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	149	271	147	155	146	154	138	724	829	224	157	143
2	156	254	147	150	148	153	116	658	640	192	167	138
3	161	221	144	154	147	146	106	590	599	270	200	131
4	166	207	135	153	152	142	95	521	532	280	246	128
5	176	201	135	149	149	135	93	428	763	383	264	138
6	191	189	140	153	148	128	134	367	1240	336	219	130
7	178	169	140	115	144	123	147	368	1390	277	185	127
8	186	166	135	100	151	123	141	328	1340	365	195	122
9	196	162	130	140	154	121	134	291	1330	360	211	132
10	206	154	135	160	153	116	139	259	1250	317	240	136
11	215	155	160	170	152	117	152	261	1160	275	222	144
12	215	149	170	160	146	108	150	620	1350	236	186	144
13	233	142	170	160	136	92	126	622	2560	210	162	141
14	225	144	170	160	134	81	115	535	2750	171	152	137
15	215	162	175	145	122	79	114	727	2230	150	141	134
16	213	165	186	145	116	83	120	900	1490	148	152	145
17	197	169	171	153	128	81	123	987	1270	133	201	147
18	202	161	170	155	145	81	125	1030	1140	126	184	143
19	200	160	158	160	144	89	119	1060	1060	130	166	147
20	191	156	159	162	144	127	124	1010	1040	128	171	149
21	191	151	157	151	146	120	146	906	1020	137	170	139
22	240	153	162	156	142	110	504	865	884	144	165	135
23	227	147	167	152	137	116	662	792	718	131	173	145
24	215	148	145	149	142	211	1370	765	613	134	215	151
25	212	149	135	147	147	287	1060	649	558	134	198	154
26	215	148	150	148	150	236	889	507	463	139	185	142
27	187	143	150	149	160	210	841	466	446	131	165	126
28	265	144	145	152	158	202	771	473	400	130	155	113
29	279	144	150	166	---	175	751	568	332	139	143	116
30	259	142	150	149	---	159	816	866	281	192	133	118
31	275	---	145	150	---	139	---	925	---	172	137	---
TOTAL	6436	5026	4733	4668	4041	4244	10321	20068	31678	6294	5660	4095
MEAN	208	168	153	151	144	137	344	647	1056	203	183	136
AC-FT	12770	9970	9390	9260	8020	8420	20470	39800	62830	12480	11230	8120
MAX	279	271	186	170	160	287	1370	1060	2750	383	264	154
MIN	149	142	130	100	116	79	93	259	281	126	133	113
CAL YR	2009	TOTAL	86544	MEAN	237	MAX	1640	MIN	65	AC-FT	171700	
WTR YR	2010	TOTAL	107264	MEAN	294	MAX	2750	MIN	79	AC-FT	212800	

MAX DISCH: 3100 CFS AT 18:15 ON Jun. 13,2010 GH 8.21 FT. SHIFT 0 FT.

MAX GH: 8.21 FT. AT 18:15 ON Jun. 13,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
WIND RIVER NEAR ESTES PARK
Water Year 2010

Location.-- Lat. 40°19'38", Long. 105°34'53"

Drainage and Period of Record.-- 4.6 sq. mi.

Equipment.-- Sutron shaft encoder connected to a Satlink satellite monitoring data collection platform (DCP) with GOES transmitter in a 4 -foot by 4-foot wooden shelter at a 4-foot steel Parshall flume. The gage is also equipped with a standalone Sutron Stage Discharge Recorder (SDR). An electric tape gage (ETG) located on the instrument shelf is the primary reference with a supplemental staff gage is located at the flume's left Ha location. The station is maintained in cooperation with the United States Bureau of Reclamation (USBR) and Colorado Division of Water Resources (DWR) to determine east slope diversions into the Colorado Big Thompson Project (C-BT) from Wind River.

Hydrologic Conditions.-- Drainage area consists of forested lands. A small reservoir is located upstream of the gage diverting approximately 300 Acre Feet (AF) of domestic water a year. This gage is used to compute the amount of native east slope water (Wind River) water being diverted or "skimmed" into the C-BT system at Adams Tunnel. Wind River is gaged above (WINDESCO) and below (WINBYPSCO) Adams Tunnel. The amount of water being taken into Adams Tunnel is the difference between the two gages. Thus, Wind River Skim = WINDESCO-WINBYPSCO. When water is not being skimmed, all flow bypasses Adams Tunnel through a buried pipeline where the WINDBYPCO gage measures and records the same water as the WINDESCO flume. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cubic feet per second (cfs) or less. Skim operations are not performed in the winter.

Gage-Height Record.-- The record is hourly averages of 15-minute satellite data with SDR data as back up. The record is complete and reliable, except for: October 26-30, November 14-18, 2009, when the flume was ice affected; November 19, 2009 and April 20, 2010, partial day records; November 20, 2009 through April 19, 2010, when the station closed for winter, no winter record maintained . The peak event gage height was taken from the backup SDR record. Although both the shaft encoder and the SDR showed good agreement on the peak event the SDR is set to record stage data on a shorter time scale; thereby allowing for better event resolution. The SDR recorded a peak stage of 1.39 ft occurring at 1220 June 16, 2010 presumably due to work being performed on upstream diversion and storage works. Instrument calibration was ensured and validated by 46 visits made to the gage by DWR and USBR staff. Instrument calibration of the shaft encoder, SDR and base gage were within +/- 0.01 feet. Skim operations occurred from May 17, 2010 (12:45) to July 26*, 2010 (10:00). *USBR accounting indicates that skim operations ended on July 22, 2010; however, this date does not correspond to a USBR visits to the site. Additionally, computed WINDESCO vs. WINBYPSCO records indicate skim operations were still occurring. A USBR visit was made on July 26, 2010 at which time the WINDESCO and WINBYPSCO computed records begin to match well. Therefore, it is suspected that skim operations actually ended on July 26, 2010.

Datum Corrections.-- On October 31, 2008 level computations indicate that the gage was found to read 0.008 feet high with respect to R.M. 5. Levels run on October 15, 2009 confirmed the October 31, 2008 findings and a correction of -0.010 feet was made to the tape length on October 15, 2009. Levels were again run on September 9, 2010 indicating that the primary reference is within 0.005 feet of the flume's average crest elevation. No further correction was made. The October 15, 2009 datum correction was not applied to the record by agreement with the USBR.

Rating.-- The control is a 4-foot metal Parshall flume. A standard 4-foot Parshall Flume rating (STD04FTPF) was used this year. The standard rating is well defined for the range of flow experienced this year except for average daily stage values falling below 0.20 feet of stage. Below this threshold the rating has been extrapolated downward to a stage of 0.00 feet. Average daily stage values below 0.20 feet occurred between: October 1, 2009 through November 19, 2009; April 20, 21, 2010 and August 27, 2010 through September 30, 2010. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 4 ft Parshall Flume is 1.30 to 67.9 cfs. Anything above or below this range is outside the +/- 5% accuracy range. Average daily flows are outside the prescribed accuracy range for a four foot Parshall flume on October 1-25, 31, 2009; November 1-14, 2009; August 27 through September 30, 2010. Four measurements were made this water year (Nos. 125-128) ranging in discharge from 1.80 to 11.0 cfs. The peak flow of 26.9 cfs occurred at 1220 June 16, 2010 at a gage height of 1.39 ft with shift of 0.00 ft.

Discharge.-- Measurements made this year as well as previous measurements showed no trends toward permanent shift conditions. Unadjusted shifts ranged from +0.01 feet to -0.01 feet. As per agreement with the USBR and Water Commissioner, discharge measurements within +/- 5% of the rating are adjusted to the rating. Measurement Nos. 125 and 126 were discounted -3%. Measurement No. 128 was discounted 7%. This measurement was made at a very low stage and was downgraded to poor. The rating was applied directly to the gage height record to compute discharge. Flows during the winter period are not recorded because of heavy ice conditions. Discharges during the winter months are insignificant and generally less than 2 cfs. The USBR is required to leave at least 2 cfs minimum flow in Wind River when they are diverting flow into the C-BT or "skimming". Skimming operations occurred between May 17, 2010 (12:45) and July 26, 2010 (10:00). A total of 843.8 acre feet was taken from the Wind River drainage into the C-BT system this year.

Special Computations.-- Discharges for October 26-30, and April 20 were estimated from partial gage height record. Discharges for November 14-19 were estimated from adjacent discharges and temperature trends. Computed discharge values were compared to computed WINBYPSCO discharge values for data validity purposes. Discharge values from WINBYPSCO were used or considered during the ice affected periods of October and November, 2009.

Remarks.-- This is a partial year record. Period of record for Water Year 2010 is October 1 to November 19, 2009 and April 20 to September 30, 2010. The record is good, except for periods of ice effect and partial day record, which are estimated and poor; and periods when the average daily flow was below the accuracy range of a 4-ft Parshall flume, which are considered fair. Station closed for winter for the period: November 20, 2009 through April 19, 2010, no record maintained . Station maintained and record developed by Russell V. Stroud.

Recommendations.--

More discharge measurements should be made as flow permit. ETG tape should be replaced as it has several splices in its medial section. Levels should be run again in the 2011 water year to monitor reference mark stability.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WIND RIVER NEAR ESTES PARK

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.59	0.45	---	---	---	---	---	2	8.6	8.1	2.1	1.2
2	0.52	0.51	---	---	---	---	---	1.8	8.6	7.6	2	1.2
3	0.46	0.49	---	---	---	---	---	1.8	8.9	7.1	2.6	1.1
4	0.5	0.49	---	---	---	---	---	1.8	8.9	6.8	2.6	1
5	0.57	0.51	---	---	---	---	---	1.8	9.2	6.2	2.4	0.98
6	0.57	0.51	---	---	---	---	---	1.9	9.7	5.9	2.3	1
7	0.59	0.47	---	---	---	---	---	1.8	10	6	2.1	1.1
8	0.53	0.45	---	---	---	---	---	1.7	11	6.3	2.2	1.1
9	0.49	0.42	---	---	---	---	---	1.8	12	5.3	2.2	0.94
10	0.58	0.44	---	---	---	---	---	1.8	13	5	2	0.96
11	0.55	0.42	---	---	---	---	---	2	13	4.6	2	0.95
12	0.56	0.48	---	---	---	---	---	2.2	15	4.2	1.9	0.84
13	0.6	0.5	---	---	---	---	---	2.1	16	4.2	1.9	0.8
14	0.62	0.3	---	---	---	---	---	2.1	15	3.8	1.8	0.91
15	0.63	0.3	---	---	---	---	---	2.2	15	3.6	1.8	0.85
16	0.6	0.3	---	---	---	---	---	2.8	15	3.3	1.8	0.9
17	0.41	0.3	---	---	---	---	---	3.5	16	3.1	1.7	0.68
18	0.42	0.3	---	---	---	---	---	4.5	15	3	1.7	0.6
19	0.43	0.3	---	---	---	---	---	5.6	15	3	1.6	0.72
20	0.53	---	---	---	---	---	1	6	14	2.8	1.6	0.76
21	0.53	---	---	---	---	---	1.2	6.4	13	2.7	1.6	0.74
22	0.49	---	---	---	---	---	2.1	6.8	13	2.6	1.5	0.71
23	0.49	---	---	---	---	---	2.2	7.3	12	2.3	1.6	0.72
24	0.59	---	---	---	---	---	1.9	7.4	11	2.2	1.5	0.72
25	0.42	---	---	---	---	---	1.9	7	11	2.1	1.5	0.68
26	0.4	---	---	---	---	---	1.7	6.6	10	1.9	1.5	0.65
27	0.5	---	---	---	---	---	1.8	6.6	10	1.8	1.3	0.63
28	0.5	---	---	---	---	---	1.8	7	9.3	2	1.3	0.66
29	0.55	---	---	---	---	---	2.1	7.8	8.8	1.9	1.2	0.66
30	0.55	---	---	---	---	---	2	8.5	8.3	2.2	1.3	0.64
31	0.57	---	---	---	---	---	---	8.8	---	1.8	1.3	---
TOTAL	16.34	7.94	---	---	---	---	19.7	131.4	355.3	123.4	55.9	25.40
MEAN	0.53	0.42	---	---	---	---	1.79	4.24	11.8	3.98	1.8	0.85
AC-FT	32	16	---	---	---	---	39	261	705	245	111	50
MAX	0.63	0.51	---	---	---	---	2.2	8.8	16	8.1	2.6	1.2
MIN	0.4	0.3	---	---	---	---	1	1.7	8.3	1.8	1.2	0.6

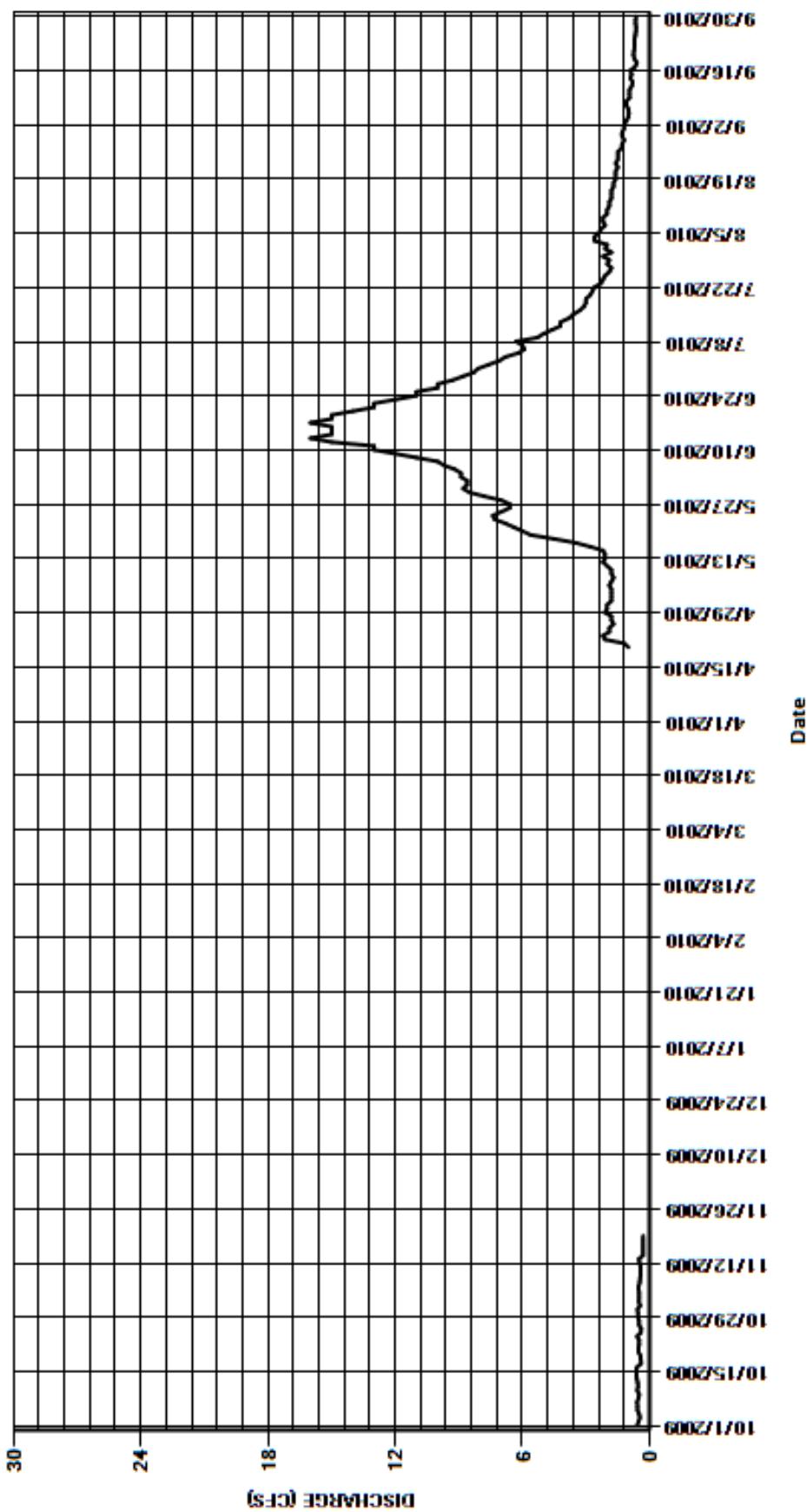
CAL YR	2009	TOTAL	563.14	MEAN	2.48	MAX	8.4	MIN	0.3	AC-FT	1120	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	735.38	MEAN	3.44	MAX	16	MIN	0.3	AC-FT	1460	(PARTIAL YEAR RECORD)

MAX DISCH: 26.9 CFS AT 12:20 ON Jun. 16,2010 GH 1.39 FT. SHIFT 0 FT.

MAX GH: 1.39 FT. AT 12:20 ON Jun. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER NEAR ESTES PARK
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

WIND RIVER BYPASS

Water Year 2010

Location.-- Lat. 40°19'38", Long. 105°34'53"

Drainage and Period of Record.-- 4.6 sq. mi.

Equipment.-- Sutron Stage Discharge Recorder (SDR) in a steel corrugated metal pipe (CMP) shelter with a steel CMP well at a 3-foot Cipolletti weir. A metal drop tape from a nonadjustable reference point is the primary reference; a supplemental staff gage is located in the weir pool adjacent to the shelter. A buried data line runs from the WINBYPSCO shelter to the Data Collection Platform (DCP) at Adams Tunnel (ADATUNCO) gage where stage data is recorded and transmitted. This gage is operated in cooperation of the Colorado Division of Water Resources and the United States Bureau of Reclamation (USBR).

Hydrologic Conditions.-- Drainage area consisting of forested lands of varying topography adjacent to Rocky Mountain National Park. A small reservoir is located upstream of the gage diverts approximately 300 Acre Feet (AF) of domestic water a year. Alva B. Adams Tunnel stilling reservoir is also located upstream of the gage. This gage is used to compute the amount of native east slope water (Wind River) water being diverted or "skimmed" into the Colorado-Big Thompson (C-BT) system at Adams Tunnel. Wind River is gaged above (WINDESCO) and below (WINBYPSCO) Adams Tunnel. The amount of water being taken into Adams Tunnel (ADATUNCO) is the difference between the two gages. Thus, Wind River Skim = WINDESCO-WINBYPSCO. When water is not being skimmed, all flow bypasses Adams Tunnel through a buried pipeline where the WINDBYPSCO gage measures and records the same water as the WINDESCO flume. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cubic feet per second (cfs) or less. Skim operations are not performed in the winter. Adams Tunnel can also release water to the Wind River Below Adams Tunnel channel as required for maintenance or safety concerns. The ADATUNCO stilling basin is equipped with a head gate and spillway; which, when in use, places water upstream of the WINDESCO control structure.

Gage-Height Record.-- The record is hourly averages of 15-minute satellite data with the SDR logged data as backup. The record is complete and reliable, except for October 28-30 and November 14-18, 2009, when the weir was ice affected; November 19, 2009 and April 20, 2010, partial day records; and, November 20, 2009 through April 19, 2010, when the station was closed for winter, no winter record maintained. Instrument calibration was maintained by 14 visits made to the gage this year. Four instrument calibration corrections ranging in magnitude from +0.01 to -0.02 feet were made throughout the year. Instrument calibrations corrections were prorated by time from the last verifiable visit to time of correction. Skimming operations of Wind River occurred from May 17, 2010 (12:45) through July 26, 2010 (10:00)*. *USBR accounting indicates that skim operations ended on July 22, 2010; however, this date does not correspond to a USBR visits to the site. Additionally, computed WINDESCO vs. WINBYPSCO records indicate skim operations were still occurring. A USBR visit was made on July 26, 2010 at which time the WINDESCO and WINBYPSCO computed records begin to match well. Therefore, it is suspected that skim operations actually ended on July 26, 2010.

Datum Corrections.-- Levels were run from the weir crest (gage datum 0.00 feet) to the base and supplemental gages on October 15, 2009. No correction was necessary to the base gage. However, the supplemental staff gage was found to be 0.066 feet lower than the weir crest. The staff was not corrected in lieu of impending gage winterization. Levels were run again on September 9, 2010 where the base gage was found to be 0.030 feet lower than the average crest elevation. Likewise, the staff gage was found to be 0.080 feet lower than the weir crest. The base gage elevation and tape length were adjusted accordingly however the staff was not adjusted in lieu of impending winter operations. A -0.03 ft correction was applied to the record beginning with start-up in April 2010, including the measurements. This presumes the change recorded on September 9, 2010 happened the previous winter. Instrument corrections were combined with the -0.03 ft datum correction for relevant periods.

Rating.-- The control is a 3-foot Cipolletti weir. A standard 3-foot Cipolletti weir rating (STD03FTCIP) was used for the entire period of record this year. Four measurements (Nos. 10-13) were made this year ranging in discharge from 1.55 to 2.09 cfs. They cover the full range of stage experienced this year well. The peak discharge of 3.79 cfs occurred at 1630 July 30, 2010 at a gage height of 0.54 feet with a shift of + 0.01 feet and a datum correction of -0.03 feet. It exceeded Measurement No. 12 made July 14, 2010 by 0.17 feet of stage and 1.70 cfs.

Discharge.-- Shifting control method was used for the period of record this year. Shifts were applied as defined by measurements and distributed by time. Current water year measurements show shifts varying between +0.01 and 0.00 feet. All measurements were give full weight.

Special Computations.-- Discharge for October 28-30 and November 14-19, 2009 was estimated from adjacent record and temperatures. Discharge for April 20, 2010 was estimated from partial record. Computed discharge values were compared to computed WINDESCO discharge values or data validity purposes. Differences in discharge values between the WINDESCO and WINBYPSCO records occurring outside the "skim" period are presumed to be due to either in part or in aggregate, slight drainage accruing to the stream from the ADATUNCO gage basin, or slight daily rounding differences and transit time allowances. Skimming operations occurred between May 17, 2010 (12:45) and July 26, 2010 (10:00) diverting 843.8 Acre Feet (AF) into the C-BT system.

Remarks.-- This is a partial year record. Period of record for Water Year 2010 is October 1 to November 19, 2009 and April 20 to September 30, 2010. The record is good, except for periods of ice affected record and partial day record, which are estimated and poor. Station was closed for winter for the period November 20, 2009 through April 19, 2010, and no record was maintained. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Levels should be run in the spring to monitor instability from frost heaving. Careful examination of skim balance should be made on real time basis. Photographs of the gage, control and channel should be taken to update and augment the Station Description.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WIND RIVER BYPASS

RATING TABLE--

STD03FTCIP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.63	0.5	---	---	---	---	---	2	1.9	2	2.1	1.3
2	0.57	0.53	---	---	---	---	---	1.8	2	2.1	1.9	1.2
3	0.5	0.5	---	---	---	---	---	1.8	2	2.1	2.4	1.2
4	0.53	0.49	---	---	---	---	---	1.8	2	2.1	2.4	1.2
5	0.63	0.54	---	---	---	---	---	1.9	2	2.2	2.3	1.1
6	0.61	0.52	---	---	---	---	---	1.9	2	2.1	2.2	1.1
7	0.6	0.48	---	---	---	---	---	1.8	2	2.2	2.1	1.3
8	0.58	0.46	---	---	---	---	---	1.8	2	2	2.1	1.2
9	0.57	0.43	---	---	---	---	---	1.8	2	2	2.1	1.1
10	0.54	0.46	---	---	---	---	---	1.9	1.9	2.1	2	1.1
11	0.58	0.44	---	---	---	---	---	1.6	2	2.1	2	1.1
12	0.62	0.49	---	---	---	---	---	2	2	2.1	2	0.98
13	0.65	0.48	---	---	---	---	---	2.1	2.1	2.1	1.9	0.9
14	0.69	0.3	---	---	---	---	---	2.1	2	2.1	1.9	1.1
15	0.69	0.3	---	---	---	---	---	2.2	1.9	2.2	1.9	1
16	0.68	0.3	---	---	---	---	---	2.7	1.9	2.2	1.9	1
17	0.46	0.3	---	---	---	---	---	2.6	1.9	2.2	1.8	0.78
18	0.47	0.3	---	---	---	---	---	2.2	1.9	2.2	1.8	0.69
19	0.48	0.3	---	---	---	---	---	2.2	1.9	2	1.7	0.8
20	0.58	---	---	---	---	---	---	1.1	2.1	1.9	1.9	0.86
21	0.58	---	---	---	---	---	---	1.4	2.1	1.9	1.9	1.6
22	0.54	---	---	---	---	---	2.2	2.1	1.9	2	1.5	0.79
23	0.54	---	---	---	---	---	2.3	2.1	1.9	2	1.6	0.82
24	0.66	---	---	---	---	---	2.1	2.1	1.7	2	1.5	0.8
25	0.46	---	---	---	---	---	2	2.1	1.7	2	1.5	0.76
26	0.41	---	---	---	---	---	1.9	2.1	1.8	1.9	1.5	0.72
27	0.51	---	---	---	---	---	1.9	2	1.9	2	1.4	0.69
28	0.5	---	---	---	---	---	1.9	2	1.9	2	1.3	0.72
29	0.55	---	---	---	---	---	2.1	1.9	2	1.9	1.3	0.72
30	0.55	---	---	---	---	---	2.1	1.9	2.2	2.2	1.3	0.69
31	0.54	---	---	---	---	---	---	1.9	---	1.9	1.3	---
TOTAL	17.50	8.12	---	---	---	---	21.0	62.6	58.2	63.8	56.0	28.55
MEAN	0.56	0.43	---	---	---	---	1.91	2.02	1.94	2.06	1.81	0.95
AC-FT	35	16	---	---	---	---	42	124	115	127	111	57
MAX	0.69	0.54	---	---	---	---	2.3	2.7	2.2	2.2	2.4	1.3
MIN	0.41	0.3	---	---	---	---	1.1	1.6	1.7	1.9	1.3	0.69

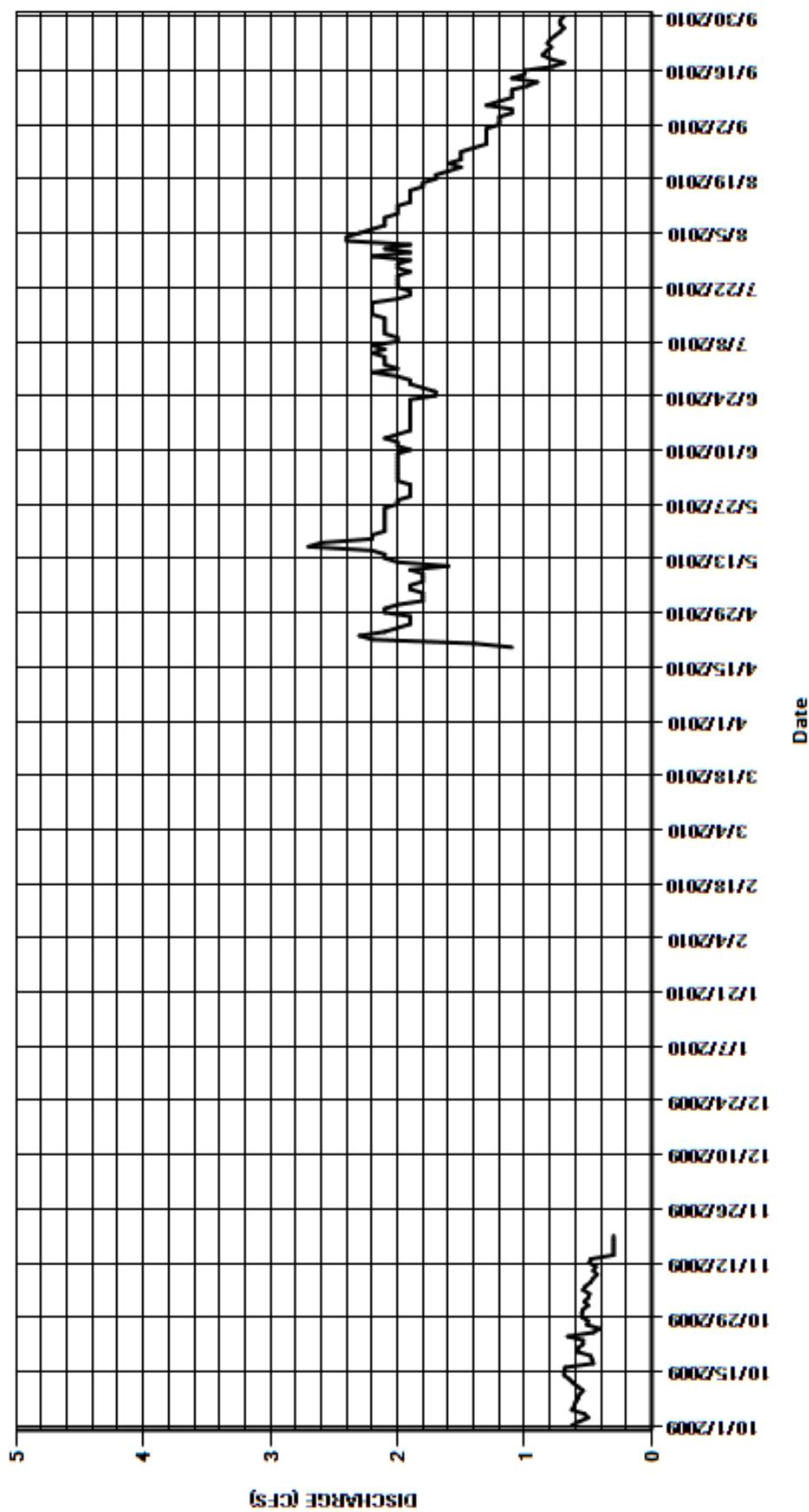
CAL YR	2009	TOTAL	302.38	MEAN	1.33	MAX	4.2	MIN	0.3	AC-FT	600	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	315.77	MEAN	1.48	MAX	2.7	MIN	0.3	AC-FT	626	(PARTIAL YEAR RECORD)

MAX DISCH: 3.79 CFS AT 16:30 ON Jul. 30,2010 GH 0.54 FT. SHIFT 0.01 FT. (-0.03 FT DATUM CORR. APPLIED)

MAX GH: 0.54 FT. AT 16:30 ON Jul. 30,2010 (-0.03 FT DATUM CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER BYPASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
Water Year 2010

Location.--	Lat. 40°22'42", Long. 105°30'48", in NW 1/4 NW 1/4 sec. 30, T.5 N., R.72 W., Larimer County on right bank in Estes Park, 600 ft downstream from bridge on State Highways 7 and 66, 900 ft downstream from Black Canyon Creek, and 0.3 mi northwest of Estes Power Plant. Station is upstream from Lake Estes.
Drainage and Period of Record.--	137 mi ² . October 1946 to current year.
Equipment.--	Quadrature Sutron shaft encoder, Sutron Stage Discharge Recorder (SDR), Sutron Tipping Bucket rain gage and temperature sensor connected to a Sutron 8210 Satellite monitoring Data Collection Platform (DCP) in a four foot by four foot precast concrete shelter and stilling well at a 15-foot concrete Parshall flume with overflow bays flanking the flume. The base gage is an electric tape gage (ETG) placed on the instrument shelf with a supplemental staff gage at the flume's Ha location. AC power and telephone services are provided by the United States Bureau of Reclamation (USBR). The well is attached to the flume via one valved inlet; and to the channel upstream of the flume and overflow bays via three valved inlets. When in overflow conditions the flume's inlet can be closed and the channel inlets opened. A supplementary (Non-Ha) staff gage, located above the flume, can be used during these periods. Stage readings will be higher than in the flume and would require a separate rating. The gage is maintained in cooperation with the USBR and the Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	Drainage area mainly comprised of forested lands (Rocky Mountain National Park) of varying topography as well as the bulk of Estes Park, CO. There are no storage projects nor diversions of significant magnitude upstream of this site. The gage is susceptible to rapid increases in stage due to storm runoff events from hardened surface. Spring runoff displays strong diurnal characteristics associated with snowmelt, peaking early in the morning. Higher than normal approach velocities due to channel grade are present at the site and are suspected to cause positive shifting to the flume rating. Moreover, constant sand and gravel accumulation upstream of the flume are also suspected of causing positive shifting conditions as water is not allowed to "still" adequately before entering the flume. The town of Estes Park placed several bank stabilization cross-vein boulder structures in the channel at an unknown date from January-April, 2008. The concept was to stabilize the left bank by diverting flow energy back to the center of the channel. However, the installation of the energy diversion structures was executed incorrectly causing flow energy to divert towards the left bank. This redirected flow energy pattern propagates through the flume. Gage-height readings at the Ha staff often read higher than the base gage. Moreover, at higher flows side-to-side velocity bias and stage stack-up can be seen across the flume's crest by visual inspection and current meter measurements.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data, with logged SDR data as backup. The record is complete and reliable except for: December 2-21, 2009 when the flume and/or stilling well were affected by ice; and, December 21, 2009 through April 19, 2010 when the gage was off-line for winter and no gage-height information is available. Good agreement between the two instruments was observed this year through frequent site visits by USBR and CDWR staff. Five instrument corrections of ± 0.01 feet were made throughout the year. The corrections were applied to the record as defined by USBR and CDWR visits. Missing hourly values on May 12, 2010 were filled in with SDR data without loss of accuracy. Rapid runoff conditions resulted in flow through the overflow bays from June 4 to 14, 2010. The inlet configuration was not changed during this period.
Datum Corrections.--	Levels were last run on October 20, 2010 to the ETG and Ha staff gage using the average flume crest elevation of 0.00 feet as the base reference. Levels showed that a correction to the ETG and staff gage was applicable. The ETG's tape length was increased 0.014 feet from a tape length of 11.908 feet to 11.922 feet with respect to the average crest elevation. The net 0.014 ft correction falls below the prescribed ±0.02 foot threshold therefore, no datum correction was applied to the record in WY 2010. The Ha staff gage was found at an elevation of 0.008 feet with respect to the average crest elevation. No adjustment could be made to the anchoring method utilized.
Rating.--	The control is a 15-foot Parshall flume with overflow weirs flanking both sides. Rating No. 9 in use since October 1, 1971 was continued this year. The rating has a break point (away from the standard Parshall) above five feet in stage when flow begins to surround the flume and go over the overflow bays. The upper section of the rating was confirmed by a 1220 cfs measurement in 2003. Shifts at this gage result from movement of sand, gravel and boulders into and out of the stilling basin upstream of the flume, causing variable and abnormally high approach velocities. Bank stabilization/erosion control structures placed in the channel upstream of the flume also have an effect on the stage-discharge relationship. The stilling basin was last cleaned by USBR personnel in October 2008. However, cleaning of the basin did not yield to the desired outcome. Since cleaning of the basin excessive amounts of sediment have deposited directly upstream from the flume. As such water entering the flume has higher approach velocities due to inadequate stilling and non-laminar conditions which contribute to deviations from the standard Parshall rating. It is postulated that changes to approach conditions resulting from sediment conditions listed above as well as other mechanisms discussed earlier (e.g. bank stabilization keystone structure) may be both transient and persistent affecting the stage discharge relationship at this gage. The combination of these conditions is presumed to have caused stronger deviation away from the standard Parshall rating especially at higher stages. Thirteen discharge measurements (Nos. 620-632) were performed this year ranging in discharge from 13.2 to 1540 cfs. Measurements cover the range of stage experienced this year well. The peak flow of 1590 cfs occurred at 0200 June 8, 2010 at a gage-height of 6.51 feet with a shift of 0.29 feet. It exceeded measurement No. 327 made later that day by 0.10 feet of stage.

Discharge.--

Shifting control method was used. Measurements show unadjusted shifts ranged from 0.04 to 0.32 feet. From November 4 to December 2, 2009 and September 16 to September 30, 2010 measurements were prorated by time as defined by measurements. Stage dependent shifting was used from October 1 to November 4, 2009 and April 19 to September 16, 2010 using three variable stage-shift relationships: BTABESCOVS09-01, BTABESCOVST10-1 and BTABESCOVST10-2. BTABESCOVS09-01 is defined by thirteen measurements (Nos. 607-620) made last year which included measurement No. 620 made this year. BTABESCOVST10-1 is defined by six measurements (Nos. 622-627) and BTABESCOVST10-2 is defined by six measurements (Nos. 627-632). All measurements were made during their respective periods of use. All measurements were given full weight except Nos. 625, 626, 632, which were adjusted from -8% to 1% to better fit the stage-shift distributions. No. 626 was an ADCP measurement. Review of the measurement deemed the measurement somewhat unreliable. It was adjusted -8%.

Special Computations.--

The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted. Discharge values for the winter period (December 2, 2009 through April 19, 2010) were taken from USBR provided accounting (enclosed). The USBR computes the native inflow to Lake Estes based on gaged outflows (BTBLES CO and OLYTUNCO) correlating the net outflow to reservoir elevation changes at Lake Estes. The computed flow is the summation of all sources of unaccounted-for water into Lake Estes, including local runoff. Note: The USBR requested that no winter measurements be performed in the flume due to concerns of damaging the newly placed concrete. As such, no measurements were made during ice conditions. Two days of the USBR provided accounting values were deemed suspect and adjusted. Enclosed accounting worksheets showed the native inflow to be 56 cfs on December 9 followed by -34 cfs on December 10, 2009. The average net difference of the two days was applied to the record.

Remarks.--

The record is good except as for periods of ice affected and no gage height record, which are estimated and fair. As discussed above, the flume's overflow bays were active from June 4 to 14, 2010. The gage's inlets were not changed to the upstream inlet configuration through this period. Stage values recorded through this period are somewhat suspect. However, due to measurements made during overflow conditions (Nos. 626 & 627), discharge values through this period are considered good. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Continued efforts to be made to find a cooperative solution to solving issues introduced by Estes Park's erosion control devices. Consideration should be given to place a gradient control /energy dissipation structure upstream of the flume; and to correct bank stabilization structures placed by the town of Estes Park. Options to increase the channels conveyance should also be considered. Options available include: removal of the channel iron spanning the flume, thereby alleviating debris accumulation issues; and, removal of one or more flashboards on both overflow bays flanking the flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

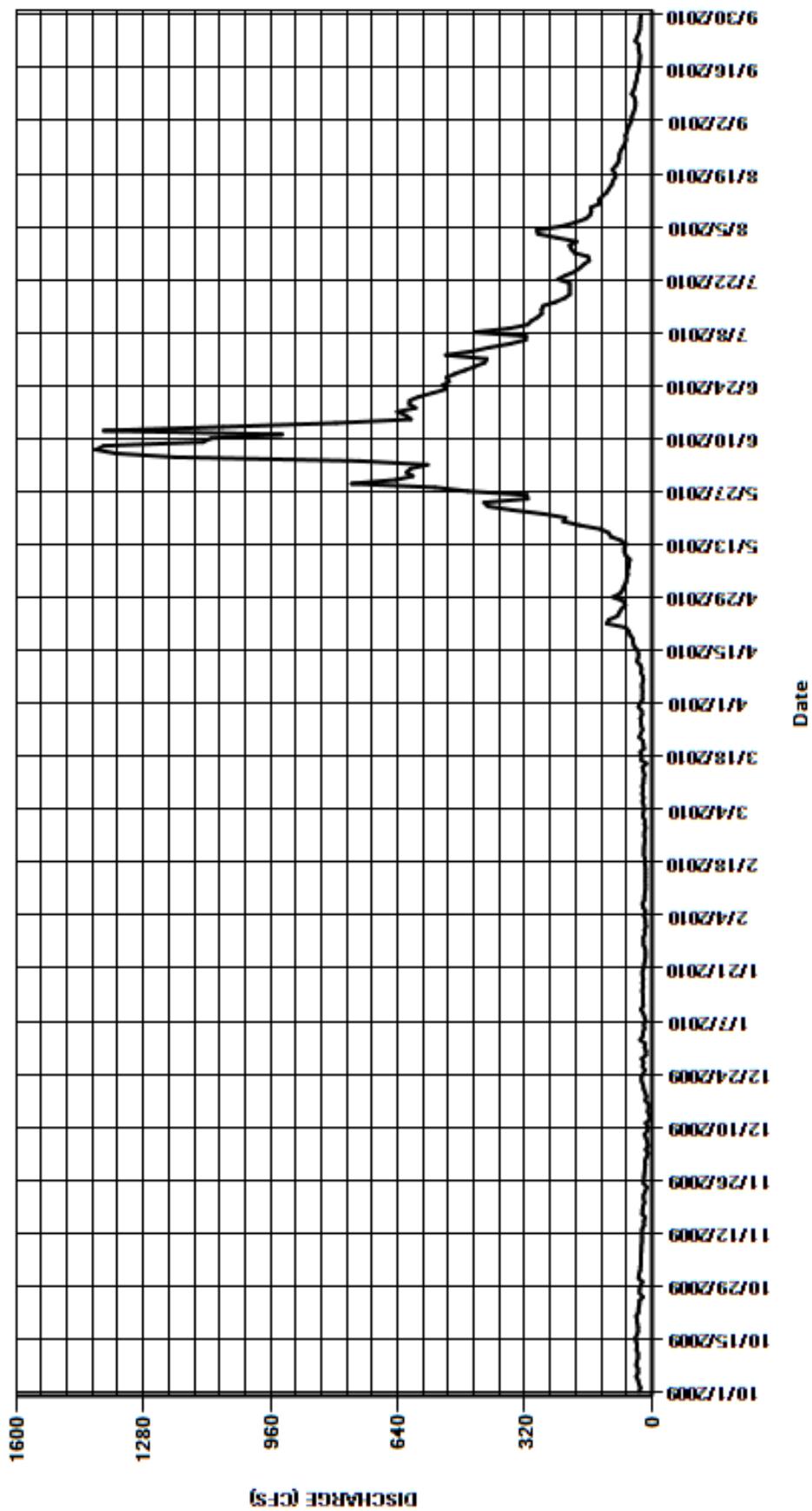
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	33	18	17	15	18	30	74	618	416	190	56
2	29	30	14	30	17	23	24	70	607	519	239	52
3	33	29	10	23	17	22	25	65	565	451	287	51
4	35	28	16	23	21	20	24	64	737	409	290	47
5	40	28	10	19	16	21	25	61	1200	356	229	44
6	35	28	12	21	22	24	25	62	1350	318	194	42
7	35	27	15	16	24	21	22	59	1400	317	167	42
8	40	27	19	19	19	25	23	58	1380	447	156	44
9	38	26	11	22	19	22	28	56	1130	361	153	51
10	35	25	11	28	18	25	26	66	1110	314	154	46
11	35	25	16	22	16	21	29	70	931	304	132	43
12	39	25	5	23	16	21	38	70	1380	288	134	41
13	38	25	7	23	17	19	35	65	1080	277	125	38
14	39	20	11	23	16	22	34	79	795	278	114	38
15	43	21	9	25	16	24	37	104	607	274	108	34
16	38	17	9	22	16	14	45	109	619	243	101	33
17	35	25	17	24	17	28	48	130	641	221	99	32
18	35	24	14	22	19	25	48	182	595	207	92	31
19	37	23	17	24	18	30	56	223	611	207	93	30
20	38	19	21	24	21	20	58	218	610	207	100	32
21	40	21	22	21	20	22	67	273	586	207	91	34
22	34	21	26	20	20	23	114	350	551	237	85	33
23	34	17	27	18	19	32	109	413	517	218	82	42
24	32	13	22	16	18	28	87	423	527	195	82	38
25	32	21	18	16	20	24	82	313	511	182	79	34
26	23	21	24	17	19	27	76	315	518	171	73	31
27	31	20	21	21	16	28	67	464	497	158	68	30
28	31	19	26	21	19	29	73	547	470	161	65	30
29	29	18	15	22	---	25	98	756	445	195	67	29
30	24	17	15	18	---	26	80	645	421	203	63	28
31	34	---	19	19	---	34	---	602	---	208	61	---
TOTAL	1074	693	497.0	659	511	743	1533	6986	23009	8549	3973	1156
MEAN	34.6	23.1	16	21.3	18.2	24	51.1	225	767	276	128	38.5
AC-FT	2130	1370	986	1310	1010	1470	3040	13860	45640	16960	7880	2290
MAX	43	33	27	30	24	34	114	756	1400	519	290	56
MIN	23	13	5	16	15	14	22	56	421	158	61	28
CAL YR	2009	TOTAL	46156.0	MEAN	126	MAX	823	MIN	5	AC-FT	91550	
WTR YR	2010	TOTAL	49383.0	MEAN	135	MAX	1400	MIN	5	AC-FT	97950	

MAX DISCH: 1590 CFS AT 02:00 ON Jun. 08,2010 GH 6.51 FT. SHIFT 0.29 FT.

MAX GH: 6.51 FT. AT 02:00 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06734500 FISH CREEK NEAR ESTES PARK
Water Year 2010

Location.--	Lat. 40°22'06", Long. 105°29'35", SW¼ sec. 29, T.5 N., R.72 W.
Drainage and Period of Record.--	16.9 mi ² . 1946 to present.
Equipment.--	Graphical water stage recorder and a Sutron shaft encoder connected to a high data rate Sutron SatLink 2 Data Collection Platform (DCP) in a 4 foot by 4 foot concrete shelter and stilling well at 5-foot Parshall flume. An electric tape gage (ETG) located on the instrument shelf is the primary reference with a supplementary staff gage located at the flume's left Ha location. The stilling well is connected to the flume via one 2-inch inlet. Gage is owned by the United States Bureau of Reclamation (USBR) and operated by the Colorado Division of Water Resources (CDWR). USBR personnel do not visit nor maintain this station on a regular basis.
Hydrologic Conditions.--	Drainage area consisting of mainly grassed and forested lands with some developed areas. Flows measured by this gage enter Lake Estes immediately downstream from the gage. It is unknown if any diversions occur upstream from the gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with chart record as backup. The record is complete and reliable except as follows: November 15, 16, 23 and 24, 2009; when the stage discharge relationship was affected by ice; November 28-30, 2009; when the gage-height record was deemed unreliable due to ice; November 30, 2009 and April 20, 2010, partial day records . The chart record was correlated to the primary data set. Values agreed within ±0.02 feet throughout the year.
Datum Corrections.--	Levels were run to the ETG and staff gage on September 9, 2010 using R.M. 0 as base. The ETG was found to be reading 0.016 feet high and the supplemental staff gage was found to be 0.008 low. No corrections were made to the references in lieu of confirming levels in 2011. No corrections were made to the gage-heights of measurements or gage-height data sets.
Rating.--	The control is a 5-foot concrete Parshall flume. Rating No. 6, developed by the United States Geologic Survey in 1951 is based on a 5-foot Parshall rating below 3.5 feet of stage and was extended upwards to 7.40 feet on a basis of slope area determination at a stage of 7.32 feet, discharge 1480 cfs. Rating No. 6 was continued this year. Three discharge measurements (No. 720-722) were made this year ranging in discharge from 1.65 to 34.0 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 5 ft Parshall Flume is 1.60 to 85.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range. Average daily discharges below 1.6 cfs, occurred on October 1-November 30, 2009; July 24-27, August 21-September 30, 2010. The peak flow of 34.9 cfs occurred at 2000 May 18, 2010 at a gage height of 1.42 feet with a shift of 0.00 ft. It exceeded measurement No. 721 made on May 19, 2010 by 0.05 feet of stage and 0.09 cfs respectively.
Discharge.--	Per agreement with the USBR, CDWR and Water Commissioner, discharge measurements within 5% of the rating are adjusted to the rating. Measurements showed unadjusted shifts ranging from -0.01 to +0.03 feet. All measurements made this year were adjusted to the rating. Although measurement No. 722 exceeded the 5% threshold discussed above, it was considered "poor" due to excessively low measurement depths. It is further assumed that extrapolation techniques used to define the lower portion of the curve are more accurate than the empirical data obtained from this particular measurement. The rating was applied directly to the gage height record to compute discharge.
Special Computations.--	This is a partial year record; as such discharge for the winter period (November 30, 2009 to April 20, 2010) was not calculated nor estimated.
Remarks.--	The record is good except periods of ice effect and partial gage height record, which are estimated and poor. October 1-November 15, November 18-22, 25-27, 2009, July 24-27, August 21-September 30, 2010 are rated fair due to poor definition of the flume rating at lower flows . This is a partial year gage and had no record for the winter period: December 1, 2009 through April 19, 2010. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	More visits and measurements to this gage should be considered as time and personnel allow. Levels should be run again in the 2011 water year. Considerations for concrete degradation remediation should be made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06734500 FISH CREEK NEAR ESTES PARK

RATING TABLE--

FISHESCO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.4	0.9	---	---	---	---	---	13	13	5.4	1.8	1.1
2	0.37	0.86	---	---	---	---	---	12	14	5.6	2.4	0.96
3	0.38	0.79	---	---	---	---	---	11	13	4.9	3	0.98
4	0.43	0.77	---	---	---	---	---	10	12	4.3	3.9	0.91
5	0.47	0.72	---	---	---	---	---	9.5	11	4.3	3.5	0.85
6	0.46	0.77	---	---	---	---	---	9.6	9	3.8	3	0.77
7	0.44	0.75	---	---	---	---	---	9.4	8.8	4	2.7	1
8	0.46	0.75	---	---	---	---	---	8.9	9.2	6.9	2.7	0.94
9	0.51	0.69	---	---	---	---	---	8.8	9.2	4.9	2.6	1
10	0.51	0.69	---	---	---	---	---	8.6	8.3	4.3	2.6	0.85
11	0.52	0.66	---	---	---	---	---	9	8.1	3.9	2.4	0.81
12	0.52	0.64	---	---	---	---	---	10	17	3.4	2.3	0.77
13	0.51	0.64	---	---	---	---	---	10	20	3.1	2.1	0.79
14	0.52	0.68	---	---	---	---	---	15	17	2.9	2	0.76
15	0.51	0.71	---	---	---	---	---	23	14	2.6	2	0.71
16	0.51	0.65	---	---	---	---	---	24	13	2.3	2.1	0.77
17	0.5	0.7	---	---	---	---	---	27	12	2.3	1.9	0.77
18	0.51	0.71	---	---	---	---	---	32	11	2.1	1.7	0.65
19	0.47	0.65	---	---	---	---	---	33	11	2	1.7	0.61
20	0.49	0.59	---	---	---	---	3.5	31	9.9	2	1.7	0.57
21	0.55	0.6	---	---	---	---	3.6	30	9.5	2.1	1.6	0.62
22	0.59	0.6	---	---	---	---	8.2	27	8.8	1.9	1.5	0.61
23	0.52	0.5	---	---	---	---	9.2	24	8.3	1.7	1.4	0.67
24	0.54	0.5	---	---	---	---	9.5	23	7.9	1.5	1.4	0.61
25	0.52	0.52	---	---	---	---	10	20	7.5	1.5	1.4	0.58
26	0.64	0.56	---	---	---	---	11	18	7	1.5	1.3	0.57
27	0.58	0.57	---	---	---	---	10	17	6.9	1.4	1.2	0.53
28	0.7	0.4	---	---	---	---	10	16	6.6	1.4	1.1	0.55
29	0.66	0.4	---	---	---	---	14	14	6	1.8	1.2	0.67
30	0.62	0.45	---	---	---	---	13	14	5.7	1.9	1.1	0.52
31	0.75	---	---	---	---	---	---	13	---	2.1	1.1	---
TOTAL	16.16	19.42	---	---	---	---	102.0	530.8	314.7	93.8	62.4	22.50
MEAN	0.52	0.65	---	---	---	---	9.27	17.1	10.5	3.03	2.01	0.75
AC-FT	32	39	---	---	---	---	202	1050	624	186	124	45
MAX	0.75	0.9	---	---	---	---	14	33	20	6.9	3.9	1.1
MIN	0.37	0.4	---	---	---	---	3.5	8.6	5.7	1.4	1.1	0.52

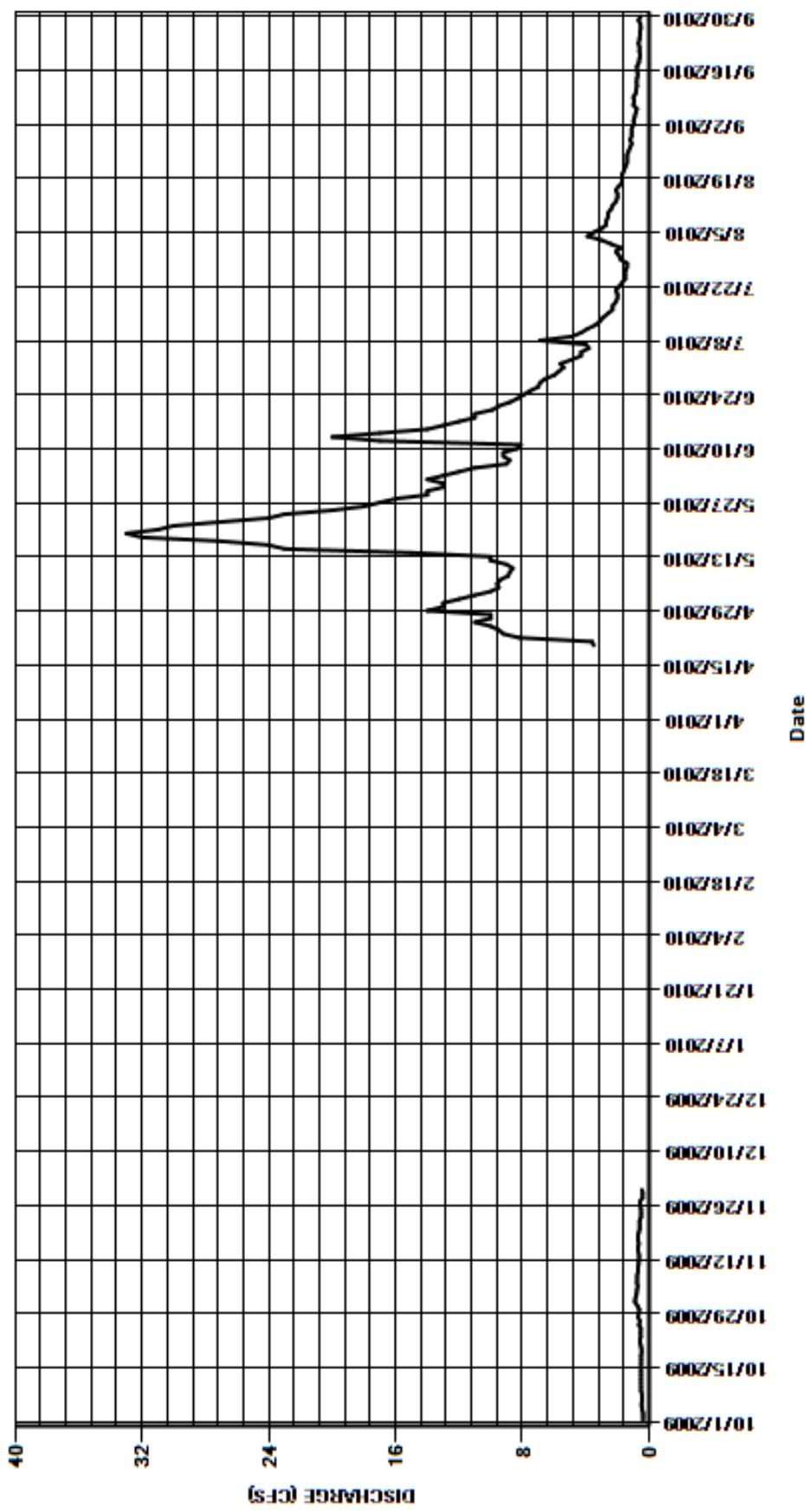
CAL YR	2009	TOTAL	516.54	MEAN	2.17	MAX	11	MIN	0.32	AC-FT	1020	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	1161.78	MEAN	5.16	MAX	33	MIN	0.37	AC-FT	2300	(PARTIAL YEAR RECORD)

MAX DISCH: 34.9 CFS AT 20:00 ON May. 18,2010 GH 1.42 FT. SHIFT 0 FT.

MAX GH: 1.42 FT. AT 20:00 ON May. 18,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734500 FISH CREEK NEAR ESTES PARK
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

Water Year 2010

Location.--	Lat. 40°22'35", Long. 105°29'06", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, T.5 N., R.72 W., Larimer County, Hydrologic Unit 10190006, on right bank 100 ft upstream from Dry Gulch, 600 ft downstream from Olympus Dam, and 2.0 mi east of Estes Park.
Drainage and Period of Record.--	155 mi ² . Area at site used Jan. 29, 1934 to Mar. 21, 1951, 162 mi ² .
Equipment.--	Design Analysis H-334 absolute shaft encoder, Sutron Stage Discharge Recorder (SDR) and a Sutron 8210 high data rate Data Collection Platform (DCP) in a four by four foot precast concrete shelter and stilling well at a 15-foot concrete Parshall Flume with overflow bays flanking the flume. AC power and telephone services are present on site. The primary reference is an electric tape gage (ETG) in the shelter. There is currently no Ha staff. The well is attached to the flume via one valved inlet; and to the channel upstream of the flume and overflow bays via three valved inlets. When in overflow conditions the flume's inlet can be closed and the channel inlets opened. A supplementary (Non-Ha) staff gage, located above the flume, can be used during these periods. Stage readings will be higher than in the flume and would require a separate rating. The channel inlets have not been operated for record purposes since the early 1950's, before the installation of the overflow flash boards. The gage is cooperatively maintained by the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	Controlled release from Olympus Dam.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data, with SDR data as backup. The record is complete and reliable. Good agreement between the two instruments was observed this year through frequent site visits by USBR and CDWR staff. All daily average stage values agreed between the two instruments within +/-0.02. The peak stage value was taken from the SDR backup data as it provided better time resolution with respect to this event. Due to the flume's proximity to the dam, ice accumulation in the approach, flume, and departing sections is generally not an issue. No ice was observed this year. However, the flume is subject to algal growth as well as debris accumulation. Three flume cleaning corrections were made that affected this year's record (October 27, 2009, January 18, 2010 and April 20, 2010). The cleaning corrections ranged from -0.01 feet to -0.04 feet. Additionally, three instrument corrections of +0.01 feet were made on June 24, September 2 and September 16, 2010. Flume cleaning corrections due to algal growth as well as instrument calibration corrections were all applied to the record as datum corrections. Rapid runoff conditions resulted in the overflow bays to become sporadically active from June 5 to 12, 2010.
Datum Corrections.--	Levels were last run on February 27, 2008 which resulted in a -0.01 foot correction to the primary reference. The correction was made in lieu of regular maintenance required to the primary reference gage.
Rating.--	The control is a 15-foot Parshall flume with two overflow bays flanking the flume. Rating No. 10, in use since October 1, 1997 is a standard 15-foot Parshall rating up to 5.00 feet of stage. The rating has been confirmed by measurements from 6.8 to 1000 cfs. Above 5.00 feet the rating is customized to account for water flowing over the overflow bays. These flows are rare and the hydraulics involved are tricky. The current rating has limited definition for flows above the boards. A June 7, 2010 observation indicated that flow will start spilling over the boards and also into the flume at a stage in the flume of approximately 5.35 feet. Fourteen current meter measurements (Nos. 199-213) were made this year ranging in discharge from 19.9 to 1000 cfs. The peak discharge of 1150 cfs occurred at 1950 June 7, 2010 at a gage height of 6.08 feet with a shift of +0.13 ft. It exceeded measurement No. 2010 made June 8, 2010 by 0.44 feet of stage and 50 cfs respectively.
Discharge.--	During normal operation, measurements within 5% of the rating are zeroed to the rating per agreement with the USBR. Measurements showed unadjusted shifts ranged from -0.02 to +0.13 feet. All measurements either computed to zero shift or were adjusted to zero shift except the following: Measurement Nos. 205 and 210 were made during special conditions and were given full weight, as discussed below. The rating was directly applied to datum adjusted gage-height values except for: March 3 through April 20, 2010: Heavy algal growth conditions were observed in the flume, and were documented by Measurement 205 (April 19, Shift = 0.04). A flume cleaning correction of indeterminate magnitude was made on April 20, 2010. Measurement No. 206) made following the cleaning returned an unadjusted shift of 0.00 feet. June 5 through June 12, 2010: when the flume's overflow bays were sporadically active. Discharges were computed using a stage dependant shift table (BTBLESICOVST10-1) comprised of three points: Measurement No. 209 (GH= 4.94 ft, Shift = 0.00, unadjusted), observed "spill" stage 5.35 ft. (Shift = 0, presumed), and, Measurement No. 210 (GH = 5.64 ft, Shift = 0.13).
Special Computations.--	The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.
Remarks.--	The record is good. The rating well defines the range in flow experienced this year except for the upper extremes when the flume's overflow bays became active (June 5-12, 2010). No notations or indications of ice Effect were present in the analysis of this record. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Fabrication of the necessary brackets and fasteners to properly and securely mount the Ha staff should be undertaken. Semi permanent installation of a clothesline style cableway for Acoustic Doppler Current Profiler (ADCP) use should be considered. Continued moderate to high flow measurements opportunities should be watched for and performed with the ADCP unit. Exercising the inlet valves should be done following the winter period.

STATE OF COLORADO
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06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

RATING TABLE--

BTBLESSCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	85	35	24	20	20	20	16	82	124	225	400	71
2	88	34	24	20	20	20	16	100	127	366	407	64
3	89	34	24	20	20	20	16	100	126	267	416	58
4	87	32	25	20	20	20	16	72	127	160	571	57
5	85	33	26	20	20	20	15	74	650	414	569	55
6	49	36	25	20	20	20	23	70	697	377	158	53
7	44	35	25	20	20	20	23	68	978	330	129	49
8	40	35	25	20	20	20	23	71	902	136	128	51
9	50	34	24	19	20	20	23	54	543	125	123	58
10	45	35	25	19	20	20	24	64	508	173	126	68
11	49	34	26	19	20	21	24	60	403	125	127	55
12	46	33	26	20	20	21	23	68	764	124	126	62
13	100	32	26	21	20	21	24	86	582	129	126	318
14	146	32	26	20	20	21	24	80	293	129	129	61
15	198	32	26	20	20	20	35	75	127	129	126	39
16	222	32	25	20	20	15	35	129	128	124	103	45
17	204	27	25	20	20	15	36	129	124	127	106	35
18	193	27	24	20	20	15	52	131	127	127	106	35
19	160	27	24	20	20	15	53	133	130	128	104	35
20	109	27	25	20	20	15	50	126	129	128	101	35
21	83	27	24	20	20	15	53	129	129	128	101	37
22	92	26	26	20	20	15	51	130	130	128	100	37
23	42	25	26	20	20	16	51	123	128	127	97	39
24	45	24	27	20	20	16	51	124	127	126	92	47
25	42	24	27	20	20	16	51	125	126	129	92	45
26	40	24	26	20	20	16	51	124	126	127	94	41
27	35	24	27	20	20	16	51	124	210	128	92	37
28	193	24	27	20	20	16	50	120	247	128	82	39
29	168	24	21	20	---	16	49	122	235	128	77	38
30	44	24	20	20	---	16	50	123	210	126	80	35
31	34	---	20	20	---	15	---	124	---	127	73	---
TOTAL	2907	892	771	618	560	552	1059	3140	9257	5245	5161	1699
MEAN	93.8	29.7	24.9	19.9	20	17.8	35.3	101	309	169	166	56.6
AC-FT	5770	1770	1530	1230	1110	1090	2100	6230	18360	10400	10240	3370
MAX	222	36	27	21	20	21	53	133	978	414	571	318
MIN	34	24	20	19	20	15	15	54	124	124	73	35

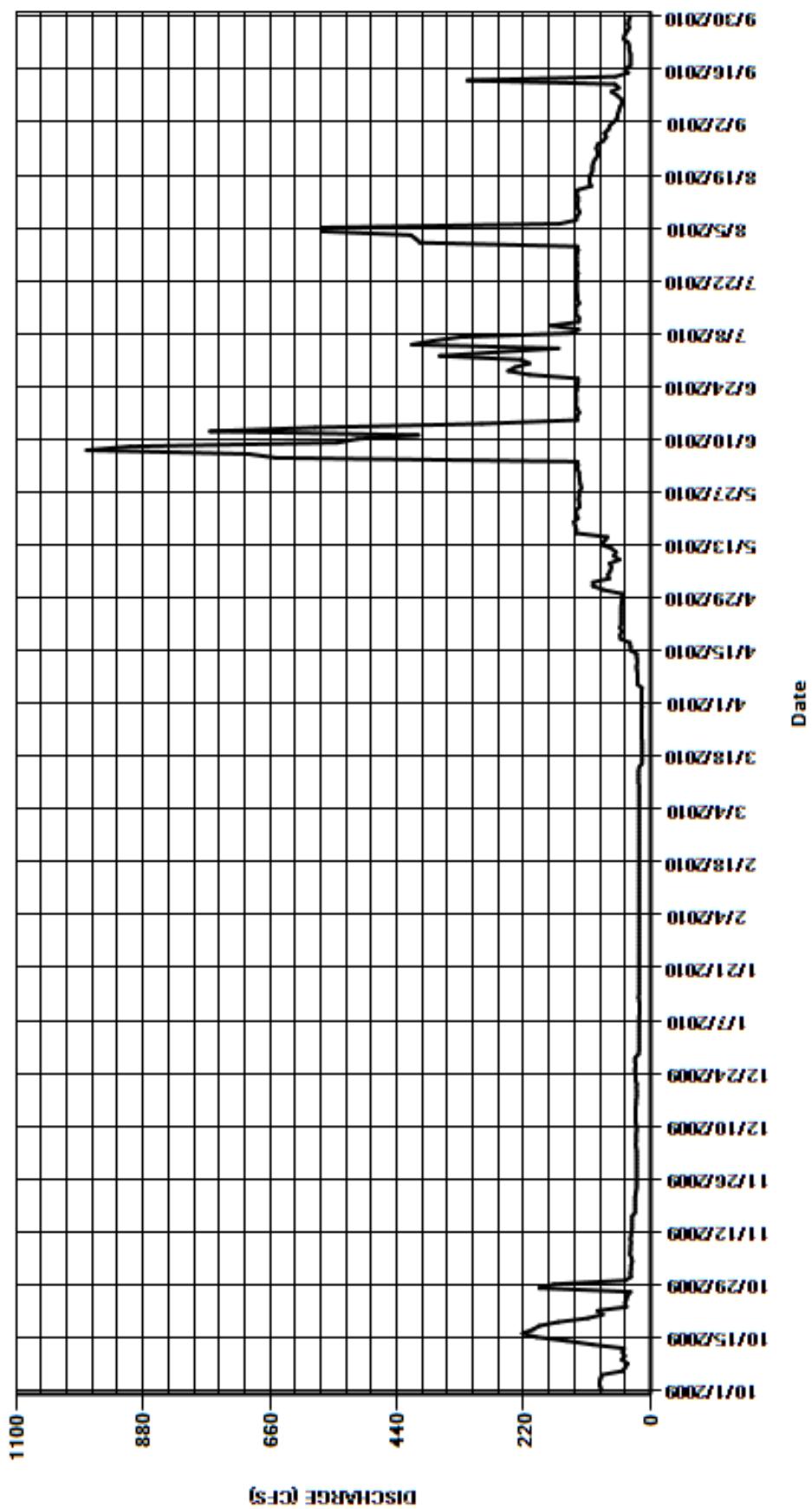
CAL YR	2009	TOTAL	28031	MEAN	76.8	MAX	406	MIN	19	AC-FT	55600
WTR YR	2010	TOTAL	31861	MEAN	87.3	MAX	978	MIN	15	AC-FT	63200

MAX DISCH: 1150 CFS AT 19:50 ON Jun. 07,2010 GH 6.08 FT. SHIFT 0.13 FT.

MAX GH: 6.08 FT. AT 19:50 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)
Water Year 2010

Location.--	Lat. 40°22'30", Long. 105°29'13", in SE 1/4 NW 1/4 sec. 29, T.5 N., R.72 W., Larimer County, Hydrologic Unit 10190006, at tunnel entrance at south end of Olympus Dam on Lake Estes, 1.9 mi east of Estes Park.
Drainage and Period of Record.--	N/A.
Equipment.--	Design Analysis H-334 incremental shaft encoder and a Sutron Stage Discharge Recorder (SDR) connected to a high data rate Sutron 8210 Data Collection Platform (DCP) in a 4-foot by 4-foot concrete shelter at a 15.2-foot wide rectangular concrete canal section. A Sontek Argonaut SW Acoustic Doppler Velocity Meter (ADVM) is placed in the center of the canal approximately 20-feet upstream from the shelter. The primary reference is an Electric Tape Gage (ETG) located in the shelter with a supplemental staff gage located on the left wing-wall of the canal. The gage is operated in cooperation of the Colorado Division of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) as part of the Colorado-Big Thompson (C-BT) Project.
Hydrologic Conditions.--	Controlled release from Olympus dam. Olympus Tunnel conveys water from Olympus Dam (Lake Estes) to Pinewood and Flatiron Reservoirs and is used to generate power at the Pole Hill and Flatiron hydroelectric power plants. Waters entering Flatiron reservoir from Olympus Tunnel can then be: conveyed to terminal storage at Horsetooth Reservoir via the Charles Hansen Feeder Canal; used for power generation at the Big Thompson Power Plant located along the Charles Hansen Feeder Canal system and then delivered to the Big Thompson River; directly delivered to the Big Thompson River via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) facility; pumped to Carter Reservoir for either terminal storage in Carter Reservoir and/or distribution through the Saint Vrain Supply Canal where direct delivery to the Saint Vrain Creek can be made; terminal storage in Boulder Reservoir via the Boulder Feeder Canal (BFCLYOCO) system.
Gage-Height Record.--	The primary record is hourly averages of 15-minute logged SDR data with telemetered data as backup. The record is complete and reliable, except for: November 16-19 and December 10-21, 2009 when both the SDR and SE float tapes slipped the instruments pulley cog. Date and time of slippages was established by comparing the two data sets. Data validation between the two instruments was generally good (within +/- 0.02-feet) with exception of: November 16-19, December 10-21, 2009, June 8-24, August 5-9, September 13-30, 2010. All other significant (> +/- 0.02 feet) variances were determined to be caused by a significant stage change occurring as a result of the USBR's operations. USBR operations cause many significant stage changes to be made at midnight which at times causes the logged midnight value (often the daily maximum or daily minimum) to be logged on a different day. This is postulated to be due to interval timing, clock calibration differences and/or difference in measurement processing times between the two instruments. Whenever this was encountered the primary data set was altered to reflect which ever showed the greater level of magnitude (larger daily maximum or lower daily minimum). The Design Analysis H-334 (SE) instrument suffered several significant failures this year (November 16; December 10, 2009; June 8; August 5, September 13, 2010) where significant changes in stage caused the encoder tape to slip on the pulley cog rendering the instrument out of calibration. Each event resulted in a different magnitude of correction required to the instrument. Frequent visits by USBR and DWR staff demonstrated good calibration and agreement between both instruments and the base gage throughout the water year with exception to the five periods listed above. Three instrumentation corrections were applied to the primary record as indicated by the SDR's event log: June 8, 2010: +0.10 feet June 24, 2010: -0.11 feet, August 9, 2010: +0.01 feet. The correction made on June 8, 2010 is unsupported and undocumented. It is further refuted by documented site observations made prior to and following this event. On June 24, 2010 a correction of equal magnitude and in the opposite direction was made. The August 9, 2010 instrument correction was discounted and not considered in this record process. The correction was discounted in lieu of: Site visits made prior to the correction showing that the instrument was calibrated correctly. The calibration of August 9, 2010 was made during a period of changing stage. It is assumed that the instrument calibration correction of August 9, 2010 was less than 0.01 feet in total magnitude and therefore no significant change would occur to the record. Peak stage of 8.64 feet was recorded by both the shaft encoder and SDR.
Datum Corrections.--	Levels were last run on November 2, 2006 to verify the installation of a new electric tape gage installed on March 23, 2006. No correction was needed.
Rating.--	The control is a rectangular concrete canal section. Rating No. 7 in use since October 2005 was continued again this year. Rating No. 7 was created using Rating No. 6 (defined by measurements) up to about 4.30 feet of stage and 272 cfs. Above this point Rating No. 7 is not based on measurements, but instead is based on USBR estimates of flow released into Olympus Tunnel. These estimates assume that the Adams tunnel gage is working properly (see ADATUNCO for more details). Rating No. 7 is a temporary solution until more resolution of noted discrepancies can be fully documented. Olympus Tunnel does not present a typical velocity distribution, and as such conventional measurement techniques will mismeasure this structure. On March 27, 2008 an ADVM was installed in the center section of Olympus Tunnel approximately 20-feet upstream from the gage shelter. The ADVM was placed in cooperation of DWR and USBR to help resolve issues associated with Rating No. 7. A velocity index rating is in the process of being developed consisting of vertically integrated current meter measurements throughout the full operational range. Current meter measurements of this type require a tremendous amount of time to perform and opportunities to perform these measurements at targeted stages are limited due to current operational practices of the tunnel. Thus, a velocity index rating may take some time to fully define and refine. Records computed using Rating No. 7 should be considered fair henceforth until such time that a comparison can be made between conventionally computed discharge values and ADVM computations. No discharge measurements were made this year. The peak flow of 603 cfs occurred at 1845 July 4, 2010 at a gage height of 8.64 feet with a shift of 0.00 ft. It exceeded measurement No. 467 made on November 13, 2007 by 2.24 feet of stage and 142 cfs respectively.

Discharge.--	Until completion of the velocity indexed rating process the rating is applied directly to the gage-height record to compute discharge. Zero flow is determined operationally. Discharge for November 6-9 and December 10-21 was estimated by using visit information for GH corrections. The magnitude of the November correction was small (0.02 ft) enough for the computed discharge to remain rated fair. The magnitude of the December correction was relatively large (0.15), but was defined well enough by visit information to also consider the computed discharges to be fair.
Special Computations.--	The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.
Remarks.--	The record is fair. November 6-9, and December 10-21, 2009 is considered estimated and fair. On December 29, 2010 the SE's float and tape configuration was altered in an attempt to alleviate float / counter weight interaction. No change was made to the SDR's float and tape configuration. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Vertically integrated current meter measurements need to be made at targeted stages for development of a velocity indexed rating. Every effort should be made to perform these measurements and develop the rating in an expeditious manner, requiring close coordination with USBR Water Scheduling staff.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)

RATING TABLE--

OLYTUNCO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	498	360	36	498	459	458	459	227	504	537	36	252
2	497	16	42	448	458	458	460	226	542	551	27	249
3	473	15	60	449	458	459	402	222	540	551	28	249
4	482	15	104	448	459	459	458	224	528	549	26	250
5	497	12	104	473	456	459	460	226	550	537	24	249
6	491	18	102	473	414	459	459	226	549	425	332	250
7	496	17	102	450	398	459	459	225	542	527	254	325
8	475	17	104	443	441	459	460	225	539	507	342	399
9	520	17	119	398	459	458	459	32	544	548	338	472
10	463	17	145	399	459	459	459	30	552	542	261	533
11	463	17	195	400	458	459	459	31	545	527	263	549
12	464	17	200	400	458	459	459	30	548	532	264	503
13	464	17	185	398	459	459	459	29	539	524	278	32
14	460	17	100	400	458	459	458	29	529	506	278	545
15	429	17	145	399	458	460	460	29	532	505	279	553
16	431	95	360	399	458	460	460	29	494	502	245	556
17	429	20	445	399	458	459	459	29	535	503	226	554
18	425	20	445	399	459	493	459	42	530	503	226	554
19	393	19	395	398	458	498	461	80	460	321	254	554
20	481	19	395	378	458	499	467	199	460	317	253	556
21	500	19	400	396	458	499	473	228	505	317	249	554
22	501	20	398	450	458	500	483	238	503	314	249	555
23	546	30	399	460	459	384	490	382	406	315	248	555
24	545	27	402	459	457	459	388	391	315	348	256	553
25	537	20	420	460	458	460	324	249	454	362	258	554
26	469	19	449	459	459	460	322	248	547	331	259	552
27	466	15	448	460	458	425	322	385	535	282	260	555
28	430	20	363	460	459	425	320	499	526	266	259	555
29	470	32	498	460	---	460	359	522	540	243	258	540
30	496	30	498	459	---	460	338	535	532	271	258	217
31	459	---	498	458	---	460	---	442	---	304	258	---
TOTAL	14750	994	8556	13430	12709	14284	12955	6509	15425	13367	7046	13374
MEAN	476	33.1	276	433	454	461	432	210	514	431	227	446
AC-FT	29260	1970	16970	26640	25210	28330	25700	12910	30600	26510	13980	26530
MAX	546	360	498	498	459	500	490	535	552	551	342	556
MIN	393	12	36	378	398	384	320	29	315	243	24	32

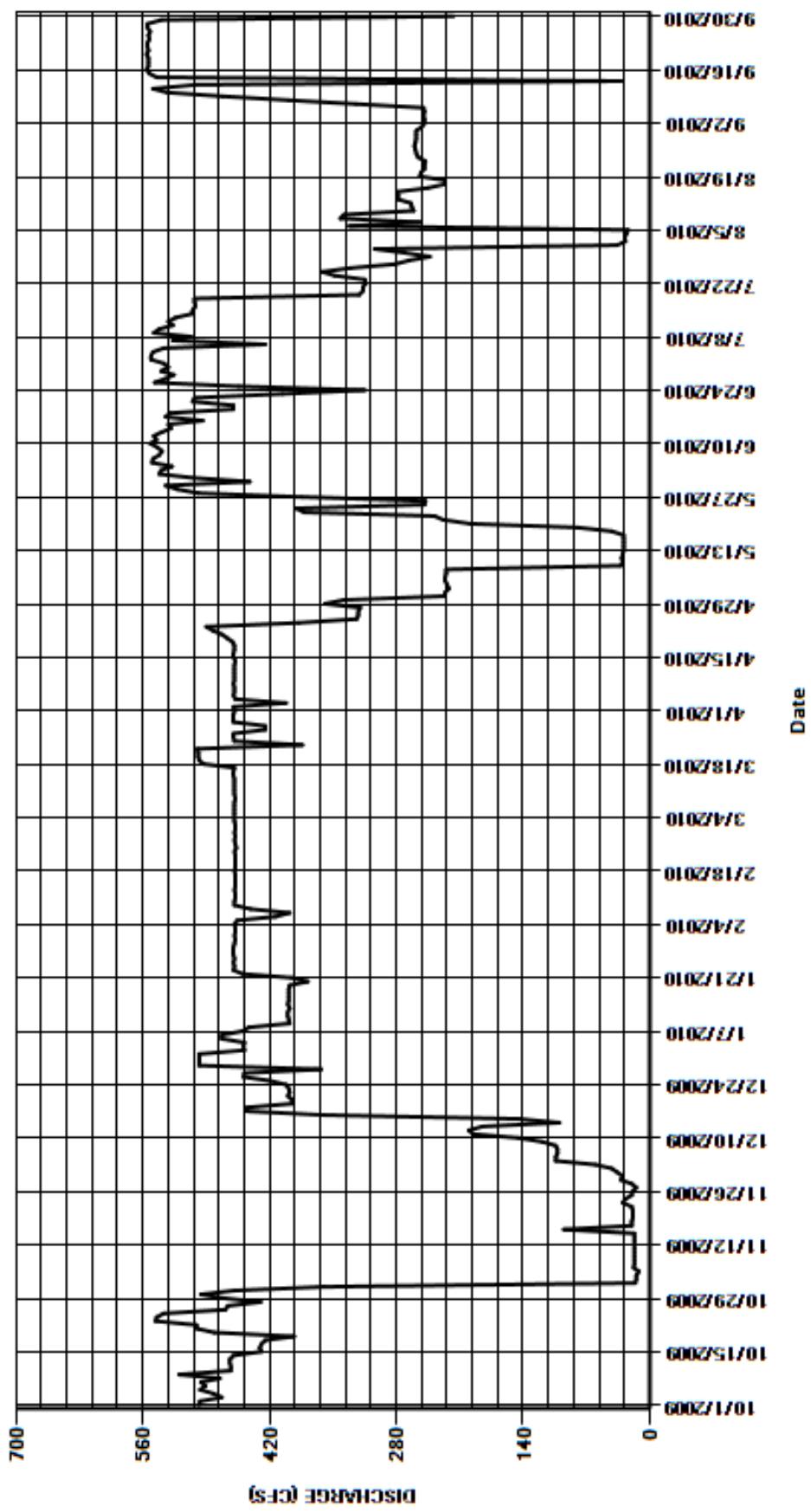
CAL YR	2009	TOTAL	138067	MEAN	378	MAX	551	MIN	12	AC-FT	273900
WTR YR	2010	TOTAL	133399	MEAN	365	MAX	556	MIN	12	AC-FT	264600

MAX DISCH: 603 CFS AT 18:45 ON Jul. 04,2010 GH 8.64 FT. SHIFT 0 FT.

MAX GH: 8.64 FT. AT 18:45 ON Jul. 04,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE
Water Year 2010

Location.--	Lat. 40°20'45", Long. 105°26'30", NW 1/4 sec. 3, T.5 N., R.71 W., Larimer County, 400 ft upstream from mouth at Drake, Co. on U. S. Highway 34 to Estes Park, Co.
Drainage and Period of Record.--	85.1 mi ² . 1947 to present.
Equipment.--	Graphical water stage recorder and a Sutron shaft encoder connected to a Sutron SatLink Data Collection Platform (DCP) in a 42-inch Corrugated Metal Pipe (CMP) shelter and stilling well. The stilling well is connected to the stream via two 2-inch inlets equipped with gate valves, street keys and a flushing tank (exterior). An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplemental cantilever chain gage located 10-feet upstream of the shelter.
Hydrologic Conditions.--	Drainage area consisting of mainly forested lands and canyons. The town of Glen Haven, other private residential properties and a state highway are built along the side of much of the north fork channel.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with chart record as backup. The record is complete and reliable, except as follows: October 29, 30, November 14-23, 2009, when the stage-discharge relationship was affected by ice; November 24-29, 2009, when gage-height data are unreliable due to frozen inlets and stilling well; November 30, 2009 – April 19, 2010, when the gage was off for winter and record is available; April 29, 30, May 19, 26, 27, June 2, 5, 9, 15, 16, 23, 30, July 1, 13, 2010, when the gage inlets were either sluggish or plugged and stage data were unreliable for four or more hours. Large consecutive flush corrections were required during the bulk of this year's runoff. Flush corrections ranged in magnitude from +0.13 to -0.09 feet. Debris accumulation (leaf detritus) on the control is an issue during the fall periods. One debris removal correction was made on November 4, 2009. The debris removal correction was applied as datum correction, prorated by time as follows: October 27, 2009 at 10:30, no correction to November 4, 2009 at 14:30, -0.01 foot correction. Peak stage value of 5.10 feet was recorded by the DCP occurring at 0500 June 12, 2010. The chart record's pen had failed prior to this event but a faint trace can be seen. Direct correlation cannot be made; however, a faint pen trace remnant can be seen on June 12, 2010 slightly later in the day at a slightly lower stage thereby indirectly confirming the peak event. The gage was visited three days prior to and four days following the peak occurrence where the shaft encoder was found to be in good calibration to the base gage.
Datum Corrections.--	Levels were last run October 15, 2009 and September 9, 2010 to verify RM establishment. No correction was required to the primary reference nor RM elevation assignments either time.
Rating.--	The control for low to moderate stages is a low head concrete dam located approximately 8-feet downstream of the shelter. The channel reverts to channel control at higher stages. As there is little freeboard in this channel, the controlling feature for flood level stages has not been determined. Rating No. 11 in use since October 1, 2002 was continued again this year. Rating No. 11 is defined by measurement from the Point of Zero Flow (PZF) occurring at 3.40 feet of stage to 232 cfs at 4.73 feet of stage. Nineteen measurements (Nos. 327-345) were made this year ranging in discharge from 4.01 to 193 cfs. Measurement made this year cover the range in stage experienced this year well with exclusion of the peak event day of June 12, 2010. The peak flow of 463 cfs occurred at 0500 June 12, 2010 at a gage height of 5.10 feet with a shift of -0.01 ft. It exceeded Measurement No.338 made June 5, 2010 by 0.45 feet of stage and 270 cfs respectively. Although visits flanking the peak event had flush corrections of substantial magnitude, it is felt that the peak event was not impaired by sluggish inlets. The rate of change and magnitude of stage of the peak event trace doesn't suggest impaired communication with the channel.
Discharge.--	Moss and debris accumulation is generally not an issue. Shifting control method was used all year with exception to the winter period listed above. Shifts were applied as defined by measurements and distributed by time with some consideration given to stage. Open water measurements show shifts varying between -0.01 feet to +0.03 feet. All measurements were given full weight except No. 337 was discounted 4% to smooth the shift distribution.
Special Computations.--	Discharge values for the ice affected periods (October 29, 30 and November 14-23, 2009) were estimated from adjacent periods of good record, discharge measurements made near or in the ice affected periods and National Weather Service (NWS) (Estes Park) temperature data as well as logged temperature data from the Big Thompson Above Lake Estes at Estes Park, CO (BTABESCO) gage upstream from BTNFDRCO gage. Similarly, discharge values for the winter period (November 24, 2009 – April 19, 2010) were estimated from seven discharge measurements (Nos. 329-333 plus two USGS measurements) made during the period as well as NWS temperature data. Discharge values for periods of sluggish or plugged inlets (April 29, 30; May 19, 26, 27; June 2, 5, 9, 15, 16, 23, 30; July 1 and 13, 2010) were estimated using graphs of estimated GH's. Revised discharges were within 8% of original record and so were considered fair, except for May 26 which is poor. May 26 GH was presumed to be entirely bad and the discharge was estimated directly from adjacent record. The gage's inlets are placed relatively near the control and are in the draw-down zone for this control. This phenomenon can be seen as an increase in deviation in stage readings obtained from the ETG vs. those obtained from the cantilever gage located further upstream, through the range in stage. The rating (BTNFDRCO11) has been developed empirically and compensates for draw-down zonal conditions.
Remarks.--	The record is good, except periods when the stage-discharge relationship was affected by ice, which are estimated and fair; periods of frozen inlets and stilling well and no gage height record, which are estimated and poor; and periods of sluggish or plugged inlets, which were estimated and fair. May 26 was estimated due to plugged inlets and is considered poor. The peak and mean daily flow of June 12, 2010 are considered poor due to poor definition. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Following this year's runoff two large pieces of the control were found to be missing. Levels run on October 15, 2009 indicated the PZF elevation was 3.40 feet; whereas levels run on September 9, 2010 indicate that the PZF is now at 3.15 feet at a location where the control had failed. Although well defined, consideration should be given to replacing the control as it has been in generally degrading condition for years and suffered significant damage this past year. Likewise, replacement of the aging inlets with relocation away from the control should be considered. If control and inlet work is not possible, a Sutron Constant Flow bubbler should be installed prior to WY 2011 runoff to combat the inlet plugging issues encountered over the last two water years. Efforts to define the upper portion of the rating should be continued. Installation of a bank operated cableway should be evaluated to help define the upper portion of the rating when available.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE

RATING TABLE--

BTNFDRCO11 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

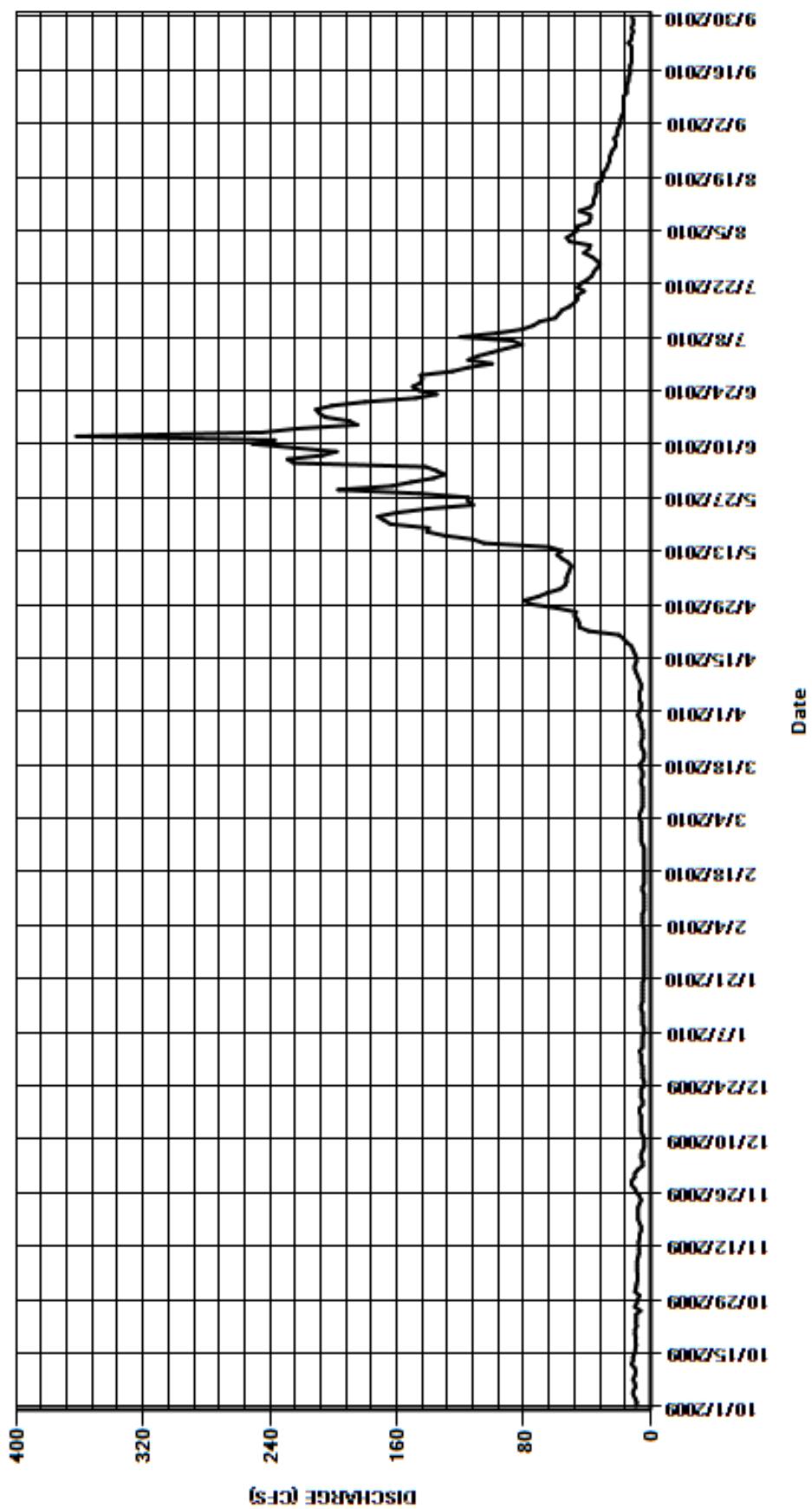
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.3	9.2	10	6	4	6	7	71	137	100	38	20
2	8.8	8.9	8	7	4	6	6	65	130	115	51	19
3	9.7	8.2	5	5	4	6	6	57	135	109	53	19
4	11	8.1	5	5	5	7	7	54	142	100	49	18
5	11	8.4	6	5	5	7	7	53	225	91	46	17
6	9.6	8.5	6	5	5	6	7	53	229	81	46	17
7	10	8.5	5	4	5	5	6	52	207	87	39	17
8	11	8.5	4	4	4	5	6	51	198	120	38	17
9	10	8	4	5	4	5	7	50	225	97	38	17
10	9.4	7.3	4	5	4	5	8	52	251	81	45	15
11	10	7.4	5	5	4	5	9	56	237	74	38	15
12	12	7.5	6	5	4	5	10	59	362	70	36	15
13	11	7.6	6	6	5	6	10	56	245	60	36	14
14	11	7	6	6	5	6	9	64	223	58	35	14
15	10	7	6	5	4	5	9	105	185	56	34	13
16	9.7	6	6	5	4	5	10	112	190	51	34	13
17	9.2	6	7	5	4	6	11	130	205	48	34	13
18	9.5	7	7	5	4	7	12	141	209	46	31	12
19	9.3	8	5	5	4	5	15	140	211	46	30	12
20	10	8	5	5	4	4	17	164	201	42	30	12
21	9.9	8	6	4	4	4	20	168	180	46	28	12
22	8.9	8	6	4	4	5	39	172	148	44	27	12
23	9.3	7	6	4	4	6	45	160	135	40	26	14
24	9.1	6	4	4	4	6	45	141	146	37	26	12
25	9.3	7	4	4	5	5	46	112	150	36	25	12
26	6.4	9	5	4	6	5	48	115	145	34	24	11
27	10	10	5	4	6	5	47	115	144	32	22	12
28	8.8	12	5	4	6	6	59	146	145	34	22	11
29	8	12	5	4	---	6	75	197	125	37	23	11
30	7	10	6	4	---	7	80	163	115	42	21	12
31	9.9	---	6	4	---	8	---	151	---	39	21	---
TOTAL	298.1	244.1	174.0	147.0	125.0	175.0	683.0	3225	5580	1953	1046	428
MEAN	9.62	8.14	5.61	4.74	4.46	5.65	22.8	104	186	63	33.7	14.3
AC-FT	591	484	345	292	248	347	1350	6400	11070	3870	2070	849
MAX	12	12	10	7	6	8	80	197	362	120	53	20
MIN	6.4	6	4	4	4	4	6	50	115	32	21	11
CAL YR	2009	TOTAL	7422.9	MEAN	20.3	MAX	89	MIN	3.9	AC-FT	14720	
WTR YR	2010	TOTAL	14078.2	MEAN	38.6	MAX	362	MIN	4	AC-FT	27920	

MAX DISCH: 463 CFS AT 05:00 ON Jun. 12,2010 GH 5.1 FT. SHIFT -0.01 FT.

MAX GH: 5.1 FT. AT 05:00 ON Jun. 12,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06736000 NORTHFORK BIG THOMPSON RIVER AT DRAKE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
DILLE TUNNEL NEAR DRAKE
Water Year 2010

Location.--	Lat. 40°25'10", Long. 105°14'45", NW 1/4 NW 1/4 sec. 9, T.5 N., R.70 W., Larimer County. Diverts water from Big Thompson River and Transmountain diversions from Colorado River basin to Hansen Feeder Canal.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) and Sutron shaft encoder connected to a Sutron SatLink Data Collection Platform (DCP) in a rectangular concrete shelter with a concrete stilling well at a 8-foot Parshall flume. The gage is equipped with an electric tape gage located on the instrument shelf serving as the primary and only active reference. A staff gage is located at the flume's Ha location but cannot be observed when the flume is operational as the flume is located approximately 80-feet downstream in the tunnel. The gage is owned by the United States Bureau of Reclamation (USBR) and is operated cooperatively by the USBR, Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (CDWR) as a component of the Colorado-Big Thompson (C-BT) system.
Hydrologic Conditions.--	Controlled diversion. Flow is regulated by a check structure and radial gate diverting water from the Big Thompson River; conveying it to the Charles Hansen Feeder Canal several miles downstream. Waters delivered to the feeder canal can then be subsequently conveyed to terminal storage at Horsetooth Reservoir or used for power generation at the Big Thompson Power Plant (BTPPMCO) with subsequent delivery back to the Big Thompson River or directly returned to the river via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) structure. A large stilling basin and energy dissipation devices are located downstream from the radial gate and upstream from the flume's converging section. Direct observation of the flume's performance is not possible.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered data with SDR data as backup. The record is complete and reliable. Instrument calibration was supported by 163 visits made to the gage by NCWCD, USBR and CDWR staff. No calibration corrections were required this year. The structure is generally not operated in winter months; however, a thermostatically controlled submersible stock tank heater has been placed in the stilling well in the event that this structure were to be operated in the winter. The SE and SDR do not completely go to zero when the tunnel is not in use. Levels and flume inspection on October 9, 2007 found the inlet invert approximately 0.09 feet above the flume floor and crest. This observation is consistent with notations of positive stage readings occurring at zero flow as well as previous year's point of zero flow (PZF) stage assumptions. Active diversion does not generally occur in this stage range; therefore, the consequence of this occurrence is minimal and only needs to be considered on "startup" and "shutdown" days.
Datum Corrections.--	Levels were last run on October 9, 2007.
Rating.--	The control is an 8-foot Parshall Flume. Prior to 1996 rating table DILTUNCO02 was used for a number of years to compensate for an obstruction in the tunnel, which has since been removed. From 1996 to 2005, a version of a standard Parshall rating table (DILTUNCO03) was used. DILTUNCO03 was expanded by tenths of a foot above a gage-height of 1.00 feet resulting in slight rounding errors when compared to a fully expanded 8 foot Parshall rating table. Rating table STD08FTPFPX was implemented on October 1, 2007. STD08FTPFPX is a standard 8 foot Parshall flume rating expanded formulaically to 5 feet of stage using a standard 8 foot Parshall flume formula. In previous years the gage was measured infrequently due to considerable safety hazards. More recently as per USBR Hazardous Energy Entry policies, the structure has not been measured as the measurement structure cannot be entered when water is actively being diverted. Mass balance computations and indirect measurements (when conditions allow) are now used to track this structure's performance. For the purposes of this record the rating has been altered to account for the inlet being 0.09 feet above the crest elevation. Discharges for stages of 0.09 feet and below were set to zero. The peak flow of 402 cfs occurred at 0545 August 2, 2010 at a gage height of 4.83 feet with a zero shift.
Discharge.--	The rating was directly applied to the primary record to compute discharge. Zero shifting was used for the entire water year, as per agreement with the USBR, NCWCD and CDWR. As noted above the shaft encoder and SDR do not fall to zero when the tunnel is not in use. As such, days where no flow was documented and stage values fell within the documented zero flow range (less than 0.09 feet of stage); discharge values were edited to reflect these zero flow occasions.
Special Computations.--	Assumed stilling well PZF is 0.09 feet of stage recorded at the stilling well. The rating table used for discharge computation has been edited to zero all discharge values at and below 0.09 feet of stage. The SDR log was manually edited for Day Light Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.

Remarks.--

Discharge measurements are not made in the flume or tunnel for safety reasons. Measurement opportunities are limited at the tunnel's east portal, due to backwater from Hansen Feeder Canal. Performing measurements upstream of the tunnel diversion is not possible due to swift water conditions and excessive depth issues. Likewise, cable and Acoustic Doppler Current Profiler measurements are not possible at or near the DILTUNCO diversion. Mass balance computations and indirect measurements (when conditions allow) are used to track this structure's performance. An opportunity to indirectly measure this structure occurred in late November, 2010; where six current meter measurements (Nos. 111-116) were made at the HFCBBSCO site. The measurements made ranged in discharge from 412 to 119 cfs with unadjusted shifts ranging from +0.26 feet to 0.00 feet. Not enough information is available to draw any conclusions regarding this structure's performance and the cause for the shifts experienced in November 2010. Zero shifting was continued this year. However, computed daily discharges exceeding 250 cfs (corresponding to the point where measurements made in November, 2010 required adjustments of more than 5% to adjust shifts to the rating) were discounted to "fair". Record is good for daily flows ranging in discharge from 0 to 250 cfs. Flows exceeding 250 cfs occurring on: May 16-22, June 6-12, July 2, 5-7 and August 1-5, 2010 are fair. Flow at this station is intermittent dependent on river flows, C-BT water orders, and other regulations. Record developed by Russell V. Stroud .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DILLE TUNNEL NEAR DRAKE

RATING TABLE--

STD08FTPFEKP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	124	125	168	305	31
2	0	0	0	0	0	0	0	151	146	258	376	26
3	0	0	0	0	0	0	0	159	162	227	372	22
4	0	0	0	0	0	0	0	134	136	90	385	20
5	0	0	0	0	0	0	0	121	110	300	390	16
6	0	0	0	0	0	0	0	115	266	332	176	15
7	0	0	0	0	0	0	0	111	373	281	115	11
8	0	0	0	0	0	0	0	109	346	139	112	10
9	0	0	0	0	0	0	0	43	284	91	109	10
10	0	0	0	0	0	0	0	68	274	128	99	14
11	0	0	0	0	0	0	0	88	273	99	105	15
12	0	0	0	0	0	0	0	94	282	83	102	15
13	0	0	0	0	0	0	0	106	80	103	100	41
14	65	0	0	0	0	0	0	111	0	121	100	14
15	127	0	0	0	0	0	0	155	0	117	99	0
16	159	0	0	0	0	0	0	263	71	121	82	0
17	154	0	0	0	0	0	0	293	26	121	75	0
18	142	0	0	0	0	0	0	290	0	115	75	0
19	111	0	0	0	0	0	0	289	35	114	75	0
20	67	0	0	0	0	0	0	289	68	114	71	0
21	15	0	0	0	0	0	0	284	93	114	70	0
22	0	0	0	0	0	0	0	241	152	114	67	0
23	0	0	0	0	0	0	0	99	172	114	63	0
24	0	0	0	0	0	0	0	54	174	107	53	0
25	0	0	0	0	0	0	0	114	173	105	50	0
26	0	0	0	0	0	0	0	134	175	108	50	0
27	0	0	0	0	0	0	0	133	170	109	42	0
28	0	0	0	0	0	0	0	152	172	103	40	0
29	79	0	0	0	---	0	0	151	148	101	40	0
30	30	0	0	0	---	0	67	149	139	101	36	0
31	0	---	0	0	---	0	---	135	---	101	35	---
TOTAL	949.00	0.00	0.00	0.00	0.00	0.00	67.00	4759	4625.00	4299	3869	260.00
MEAN	30.6	0	0	0	0	0	2.23	154	154	139	125	8.67
AC-FT	1880	0	0	0	0	0	133	9440	9170	8530	7670	516
MAX	159	0	0	0	0	0	67	293	373	332	390	41
MIN	0	0	0	0	0	0	0	43	0	83	35	0

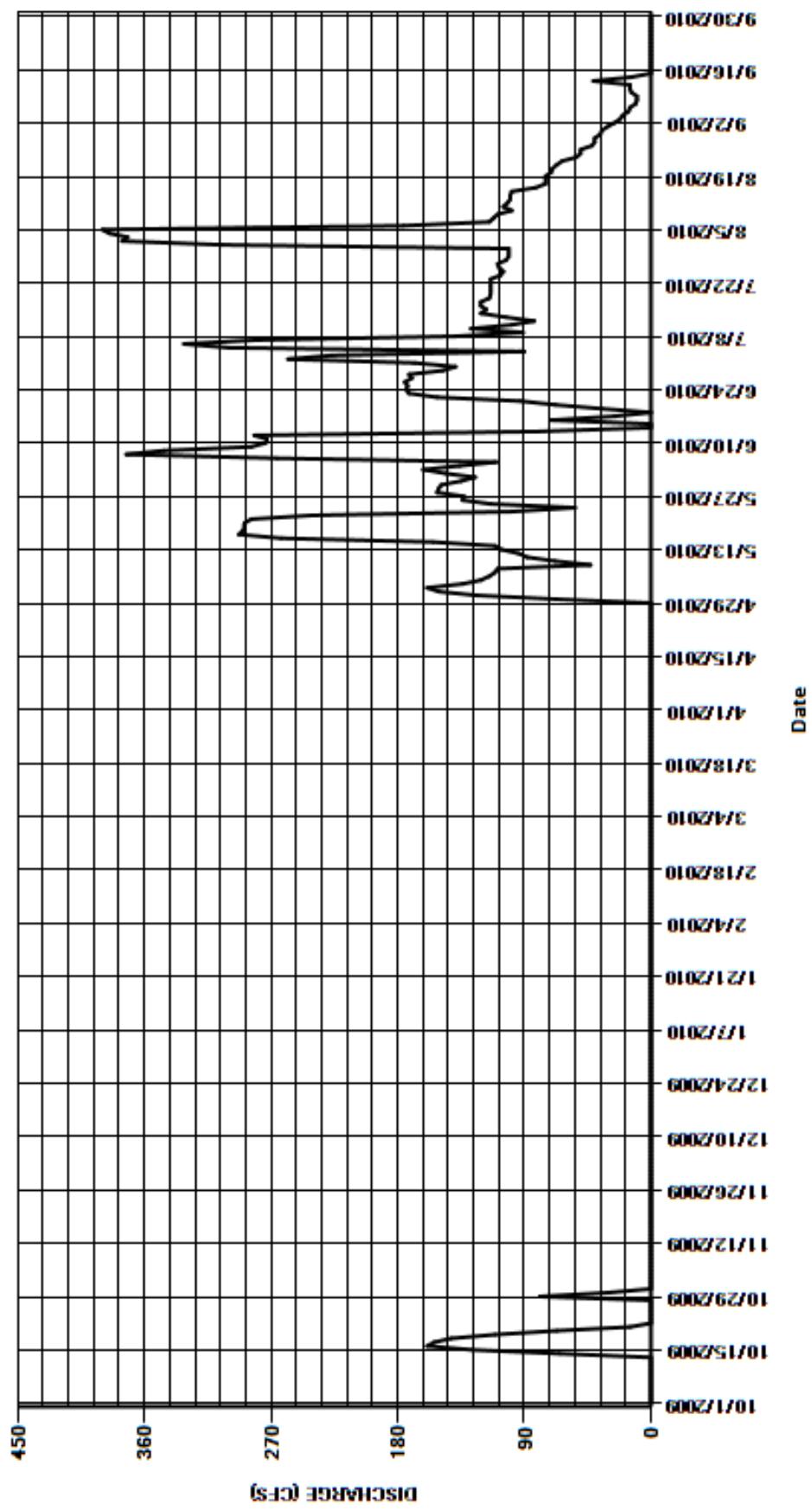
CAL YR	2009	TOTAL	10382.23	MEAN	28.4	MAX	300	MIN	0	AC-FT	20590
WTR YR	2010	TOTAL	18828.00	MEAN	51.6	MAX	390	MIN	0	AC-FT	37350

MAX DISCH: 402 CFS AT 05:45 ON Aug. 02,2010 GH 4.83 FT. SHIFT 0 FT.

MAX GH: 4.83 FT. AT 05:45 ON Aug. 02,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DILLE TUNNEL NEAR DRAKE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

Water Year 2010

Location.--	Lat. 40°25'18", Long. 105°13'34", in SW¼SW¼ sec. 3, T,5 N., R.70 W., Larimer County, Hydrologic Unit 10190006, on right bank at mouth of canyon, 400 ft upstream from Handy Ditch diversion dam, and 6.0 mi east of Drake.
Drainage and Period of Record.--	305 mi ² . 1927-1933, 1938 to present.
Equipment.--	Sutron Constant Flow Bubbler (CFB) in 6-foot by 6-foot pre-cast concrete shelter at a low head concrete dam control. A cantilever style wire weight gage located on the right edge of water near the shelter is the primary reference with no provisions for a supplemental reference. The CFB is connected to the Hansen Feeder Canal Wasteway to the Big Thompson River (HFCWASCO) Data Collection Platform (DCP) via a Design Analysis H-423 (SDI-12 to RS-485 converter unit) carried by buried copper wire placed by the United States Bureau of Reclamation (USBR). A Design Analysis H-416 (SDI-12 to 4-20mA converter) is also connected to the CFB unit to provide a Supervisory Control and Data Acquisition (SCADA) output to the USBR's control center. A Tacoma style bank operated cableway was placed approximately 120-ft. upstream from the gage shelter in April 2010. Cableway installation will allow for measurement of flows that were not captured in previous years due to condemnation and subsequent removal of the manned cableway. This gage is operated and maintained by the Colorado Division of Water Resources (DWR) and is simultaneously used by the DWR, USBR, Northern Colorado Water Conservancy District (NCWCD) and the Home Supply Ditch Company.
Hydrologic Conditions.--	Drainage area consisting of widely varying terrain, vegetative types, hardened surfaces and one substantial diversion, Dille Tunnel Near Drake, CO (DILTUNCO). Flow patterns are largely regulated by Colorado Big Thompson (C-BT) Project operations occurring upstream from this gage from Lake Estes to the DILTUNCO site. High flows encountered at this gage this year were due to higher than expected runoff inflows to Lake Estes. As a result the Bureau made larger than typical releases to the Big Thompson River. Bank inflow into the channel below the control continues to be an issue and is suspected to have increased in the past several years. Water traveling around the gage and control structures may contribute to differences seen in mass balance computations within the Big Thompson Canyon system.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with the CFB's independent log as backup. The record is complete and reliable, except as follows: October 23, 2009, CFB failure, no backup available, missing values were interpolated from adjacent record . November 24-29, 2009, when the gage was ice affected ; November 30, 2009 and March 29, 2010, partial day records corresponding to instrument deactivation and activation days; December 1, 2009 – March 28, 2010, gage shutdown for winter, no gage-height information available. On August 1-2, 2010, there were numerous hours of missing data due to a SDI-12 communication failure with the HFCWASCO DCP. Missing data were filled in with CFB logged data without loss of accuracy .
Datum Corrections.--	Levels were run on October 30, 2008 and October 15, 2009 showing corrections to the base reference of -0.051 and -0.044 feet respectively. Corrections were not made in either case in lieu of tracking movement of the gage's infrastructure. Levels run over the last several years indicate significant instability in the areas surrounding the gage as well as the control. Efforts to substantiate the instability will continue to be made. As was done in the 2009 record a -0.05 ft datum correction was applied to the entirety of the water year 2010 record.
Rating.--	The control is a concrete dam approximately 20 feet below the gage shelter. Rating No. 16 in use since October 1, 2000 was continued this year. It is defined by measurements from 4 to 2100 cfs. Flows up to about 150 cfs can be waded near the gage. Flows above the wadeable limit are measured using the Tacoma style bank operated cableway. Sixteen discharge measurements (No's 334-349) were performed this year ranging in discharge from 30.3 to 725 cfs. The peak discharge of 1200 cfs occurred at 2000 June 12, 2010 at a gage height of 4.43 ft (datum correction of -0.05 feet applied) with a shift of 0.04 ft.
Discharge.--	Shifting control method was used all year. Measureemnts show unadjusted shifts ranged from -0.05 to +0.07 feet. Shifts were distributed by time for the period October 1, 2009 – November 24, 2009 as defined by measurements Nos. 334-337. Msmt No. 334 was adjusted -7% to smooth the shift distribution. Shifts were distributed by stage for the remainder of the water year using three variable stage-shift relationships. BTCANYCOVST10-1 was applied March 30, 2010 to the peak event on June 12, 2010, and is defined by Msmt Nos. 338-343 made during the period of application. No. 343 was downgraded due to excessive swimming of the Columbus weight and current meter and was discounted 8% to better fit the stage-shift distribution. BTCANYCOVST10-2 was applied from the peak event on June 12, 2010 – August 5, 2010, and is defined by Msmt Nos. 342-347 made during the period of application. No. 345 was discounted -4% to better fit the stage -shift distribution. BTCANYCOVST10-3 was applied August 5, 2010 – September 30, 2010 and is defined by Msmt Nos. 347-349 made during the period of use and No. 350 made in the 2011 water year. No. 350 was adjusted 5% to better fit the stage-shift distribution .
Special Computations.--	Winter measurements are not made at this gage due to extremely heavy ice conditions. Discharge for the ice affected period (November 24 – 29, 2009) was estimated from adjacent periods of good record and correlated to a mass balance calculation (BTBLESKO + BTNFDRCO – DILTUNCO = BTCANYCO). Likewise discharge for the winter period (November 30, 2009 through March 29, 2010) was computed from the mass balance calculation with respect to temperature data logged at the HFCWASCO and Big Thompson above Lake Estes (BTABESCO) gages. Reasonable agreement is illustrated from the computed BTCANYCO record and actual BTCANYCO record prior to as well as following winter operations. Winter estimation is typically correlated to the Home Supply winter diversion values; however, the Water Commissioner was unable to provide diversion data at the time of this evaluation.
Remarks.--	The record is good except for periods of ice effect and no gage height record, which are estimated and poor. October 23, 2009, when the gage suffered instrumentation failure is estimated and fair. Mean daily flow on June 12, 2010 and the peak on June 12 are rated fair due to periods of flow exceeding 150% of the highest measurement. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Strict adherence to running levels twice per year is required. The stability of the control, reference points and the Point of Zero Flow (PZF) is questionable and needs to be monitored and substantiated. Inflow immediately below the control needs to be monitored for "piping" of road base material as well as significant changes in discharge.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

RATING TABLE--

BTCANYCO16 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	42	30	25	25	27	33	73	153	141	59	51
2	83	41	30	25	25	27	25	64	127	165	64	50
3	86	40	30	25	25	28	28	46	106	169	80	50
4	86	40	30	25	26	29	27	41	138	170	182	48
5	85	39	30	25	26	29	25	43	687	134	192	50
6	64	41	30	25	26	28	30	45	751	112	103	48
7	50	41	30	25	26	27	32	41	815	128	52	48
8	47	40	30	25	26	28	31	40	913	144	51	48
9	48	40	30	25	25	28	33	81	509	123	49	53
10	47	39	30	25	25	27	34	62	474	106	68	55
11	50	38	30	25	25	27	34	54	352	101	54	51
12	51	39	30	26	25	28	36	61	725	100	55	47
13	79	37	30	28	26	29	37	59	934	83	54	219
14	66	36	30	26	26	28	36	88	670	63	56	122
15	57	38	30	26	25	29	41	158	358	65	54	50
16	56	35	30	26	25	30	48	74	264	53	56	47
17	49	33	30	26	25	30	49	50	301	51	58	44
18	50	34	30	26	25	28	57	62	316	54	55	41
19	57	34	30	26	25	25	66	64	273	55	51	40
20	58	33	30	26	25	24	65	42	231	56	52	41
21	75	36	30	25	25	25	71	39	195	66	50	40
22	86	33	30	25	25	30	113	71	123	62	51	41
23	64	30	30	25	25	31	132	210	92	54	52	43
24	47	28	30	25	25	30	148	250	85	55	57	45
25	47	30	30	24	27	28	148	162	79	57	56	48
26	43	30	30	24	28	28	147	131	73	53	56	46
27	43	30	30	24	28	30	140	144	134	50	62	41
28	140	29	30	24	27	30	145	119	185	57	57	40
29	91	30	25	24	---	31	188	140	192	65	52	41
30	55	30	25	25	---	31	133	137	170	68	54	38
31	43	---	25	25	---	33	---	147	---	63	52	---
TOTAL	1986	1066	915	781	717	883	2132	2798	10425	2723	2044	1626
MEAN	64.1	35.5	29.5	25.2	25.6	28.5	71.1	90.3	348	87.8	65.9	54.2
AC-FT	3940	2110	1810	1550	1420	1750	4230	5550	20680	5400	4050	3230
MAX	140	42	30	28	28	33	188	250	934	170	192	219
MIN	43	28	25	24	25	24	25	39	73	50	49	38

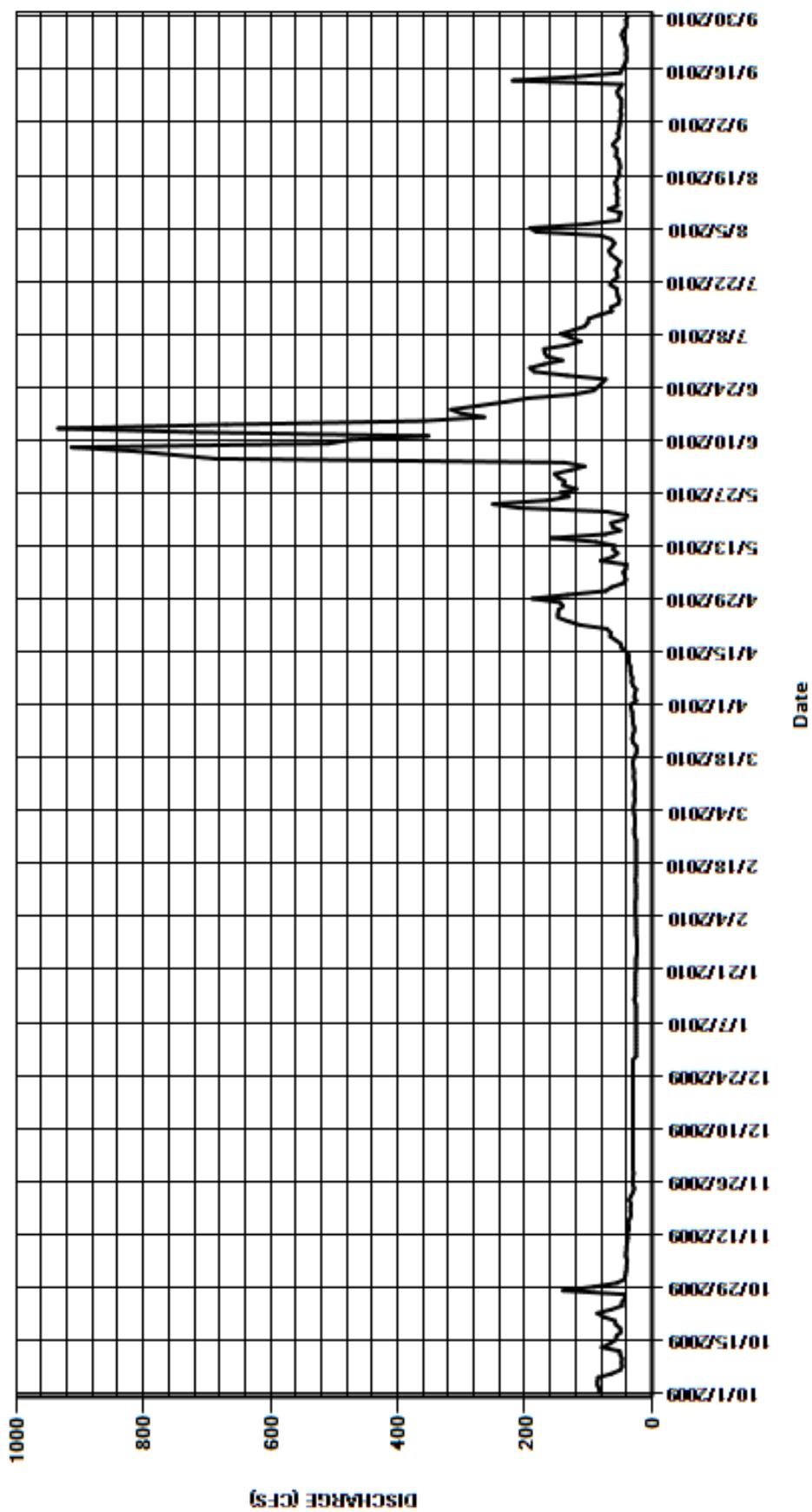
CAL YR	2009	TOTAL	23749	MEAN	65.1	MAX	265	MIN	25	AC-FT	47110
WTR YR	2010	TOTAL	28096	MEAN	77	MAX	934	MIN	24	AC-FT	55730

MAX DISCH: 1200 CFS AT 20:00 ON Jun. 12,2010 GH 4.43 FT. SHIFT 0.04 FT. (-0.05 FT DATUM CORR. APPLIED)

MAX GH: 4.43 FT. AT 20:00 ON Jun. 12,2010 (-0.05 FT DATUM CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06739500 BUCKHORN CREEK NEAR MASONVILLE
Water Year 2010

Location.--	Lat. 40°26'04", Long. 105°10'47", just downstream from Larimer County Road 24H bridge over Buckhorn Creek.
Drainage and Period of Record.--	140 mi ² .
Equipment.--	Graphic water stage recorder, shaft encoder and Sutron High Data Rate (HDR) Data Collection Platform (DCP) in a wooden shelter and stilling well. Electric drop tape gage is the primary reference.
Hydrologic Conditions.--	Drainage area consists of low timber and plains drainage, with storm runoff but no high snow. Numerous rural road bridges and culverts span the creek.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with chart as backup. The record is complete and reliable, except for the following days when the gage was affected by ice: December 8-12, 24-25, 2009, January 7-9, February 23, 2010. A -0.03 ft correction was found when debris was cleaned off control on October 27, 2009. This was distributed as a datum correction to keep the base flow relatively constant. Three small encoder calibration corrections were made ranging from -0.01 ft to +0.01 ft on February 18, 2010, April 20, 2010 and April 24, 2010.
Datum Corrections.--	Levels were last run in 2000.
Rating.--	Low and medium water control is concrete with two 6-inch by 8-inch treated timbers bolted to the top of the concrete. The channel slopes up from this control towards the right bank. Higher stages also flow through the left (east) side of the bridge. Control at high stages is influenced by the willows, shrubs and trees on the right side, and by the channel conditions downstream of the concrete dam. The dam submerges at high flows. Due to sustained higher than normal flows this water year a new rating (No. 10) was created and used for the entire water year. The rating is defined to about 2000 cfs. There appears to be a break in the rating due to the change in control at higher flows. Sixteen measurements (Nos. 628 - 643) were made this water year ranging in discharge from 1.00 to 187 cfs. They cover the range in stage experienced this year well, except the lower mean daily flows of December 5, 6, which were below the lowest measurement of 1.00 cfs by only a few hundredths cfs. There was only one daily discharge above the highest measured discharge of 187 cfs which was 189 cfs on May 17, 2010. Peak flow of 266 cfs occurred at 1945 July 4, 2010 at a gage height of 7.60 ft with a shift of +0.01 ft. It exceeded measurement No. 639 by 79 cfs and 0.73 feet of stage respectively. This peak was a rain event and was a very sharp 'spike' which only lasted a few hours.
Discharge.--	Shifting control method was used all year. Shifts are caused by material on the control at low stages and by variable effects of vegetation when the flow spreads out around the timber control. Measurements showed unadjusted shifts ranged from -0.06 to +0.04 feet. Measurement No. 635 was discounted to better fit shift distributions. Timing of the measurements allowed shifts to be applied by time without consideration to stage.
Special Computations.--	Discharges for the ice affected days were interpolated from days of good gage height on both sides of the affected periods.
Remarks.--	The record is good, except for periods of ice effect, which are estimated and poor. Station maintained and record developed by Lee Cunning.
Recommendations.--	Outside readings are needed for measurements and visits, so the unreadable outside staff needs to be repaired or replaced. The control needs to be extended to the east where water is going around the timber. A full set of levels need to be run, re-marking all BM's. The description needs to be updated with secondary BM information and photos.

STATE OF COLORADO
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06739500 BUCKHORN CREEK NEAR MASONVILLE

RATING TABLE--

BUCRMVCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

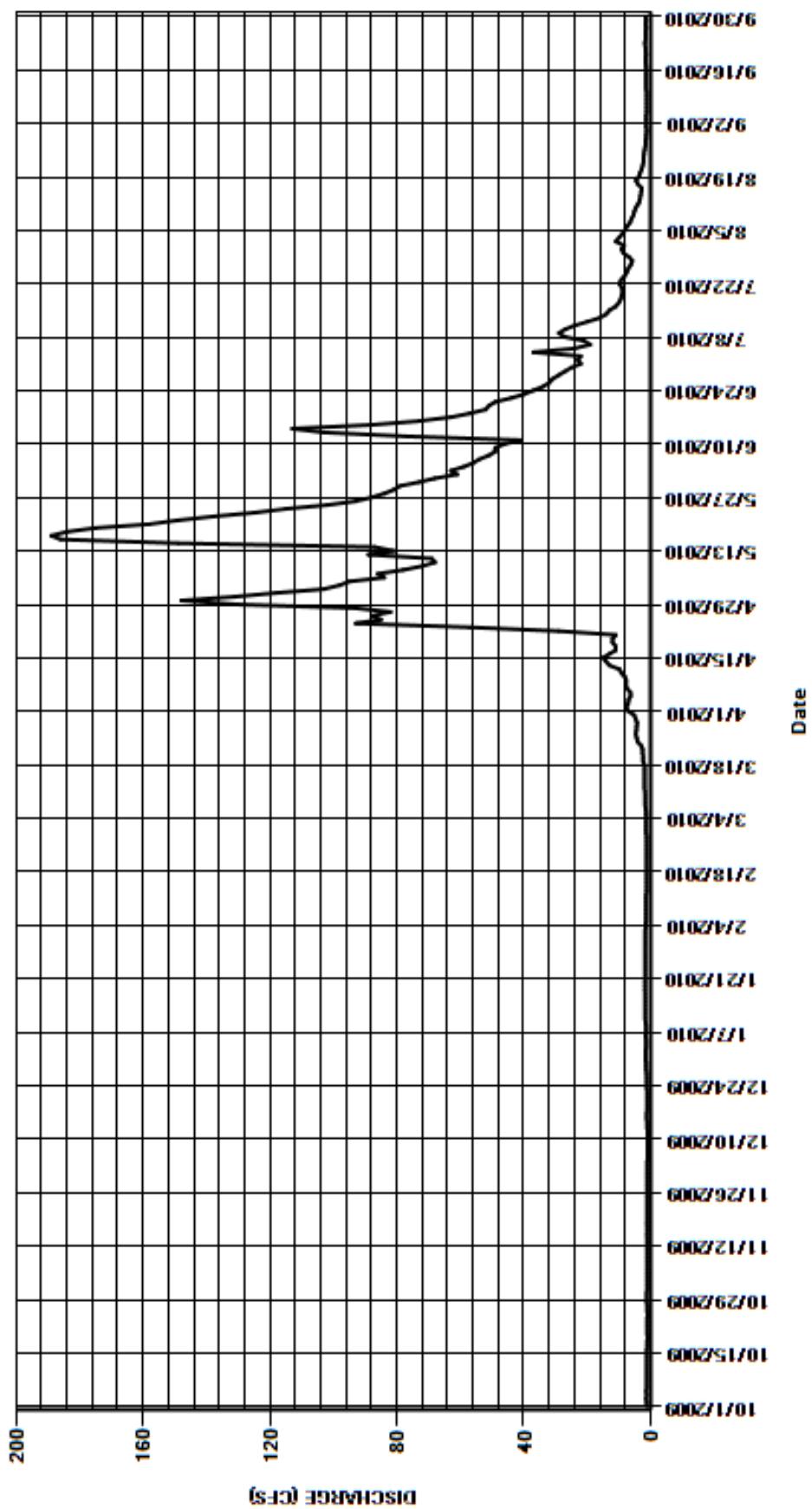
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	1.1	1.1	1.6	1.7	1.5	7	131	68	22	8.4	1.4
2	1.3	1.1	1.1	1.6	1.7	1.5	7.7	118	61	23	11	1.4
3	1.4	1.1	1.1	1.5	1.7	1.5	7.1	103	63	22	10	1.4
4	1.3	1.1	1.1	1.5	1.6	1.5	7	98	59	37	8.9	1.4
5	1.4	1.1	0.96	1.5	1.5	1.5	6.3	95	56	24	8.1	1.3
6	1.2	1.1	0.99	1.6	1.5	1.5	6.4	84	54	19	7.4	1.3
7	1.2	1.1	1	1.5	1.5	1.7	7.5	86	51	21	6.5	1.3
8	1.2	1.1	1	1.5	1.5	1.7	7.8	78	49	27	6	1.3
9	1.2	1.1	1	1.5	1.5	1.7	7.7	72	49	29	5.4	1.3
10	1.2	1.1	1	1.7	1.5	1.7	8.1	68	46	27	5.1	1.3
11	1.2	1.1	1	1.7	1.5	1.8	9.2	69	41	24	4.6	1.4
12	1.2	1.1	1	1.7	1.4	1.9	9.8	89	77	20	3.8	1.4
13	1.2	1.1	1.1	1.7	1.3	1.9	13	81	103	16	3.4	1.4
14	1.2	1.1	1.1	1.7	1.3	1.9	14	87	113	14	3.2	1.4
15	1.2	1.2	1.2	1.7	1.3	1.9	15	149	88	13	3	1.4
16	1.2	1.1	1.2	1.7	1.3	1.9	13	186	73	11	2.8	1.5
17	1.1	1.1	1.2	1.7	1.3	1.9	11	189	63	10	4	1.5
18	1.1	1.2	1.1	1.8	1.3	2	11	184	57	9.4	4.6	1.6
19	1	1.1	1.1	1.8	1.3	2.4	12	175	52	9.1	3.7	1.6
20	1.1	1.1	1.1	1.8	1.3	2.4	12	158	51	8.8	3.3	1.5
21	1.1	1.1	1.1	1.7	1.3	2.5	11	149	49	9.1	2.8	1.6
22	1.1	1.1	1.1	1.7	1.3	2.5	29	138	44	9.9	2.5	1.7
23	1.1	1.1	1.2	1.7	1.3	3	57	125	40	9.3	2.2	1.8
24	1.1	1.1	1.2	1.7	1.3	4.1	93	115	37	8.2	2.2	1.6
25	1	1.1	1.2	1.7	1.3	4.4	85	102	34	7.5	2.1	1.6
26	1.1	1.1	1.2	1.7	1.3	4.7	88	93	32	7	1.9	1.6
27	1.1	1.1	1.3	1.7	1.3	4.5	82	88	31	6.2	1.7	1.5
28	1.2	1.1	1.4	1.7	1.4	4.4	93	84	29	5.8	1.6	1.6
29	1.2	1.1	1.5	1.7	---	4.3	131	81	27	6.9	1.5	1.5
30	1.2	1.1	1.5	1.7	---	4.7	148	79	25	8.6	1.4	1.6
31	1.2	---	1.6	1.7	---	5.2	---	73	---	9.2	1.3	---
TOTAL	36.5	33.2	35.75	51.5	39.5	80.1	1009.6	3427	1622	474.0	134.4	44.2
MEAN	1.18	1.11	1.15	1.66	1.41	2.58	33.7	111	54.1	15.3	4.34	1.47
AC-FT	72	66	71	102	78	159	2000	6800	3220	940	267	88
MAX	1.4	1.2	1.6	1.8	1.7	5.2	148	189	113	37	11	1.8
MIN	1	1.1	0.96	1.5	1.3	1.5	6.3	68	25	5.8	1.3	1.3
CAL YR	2009	TOTAL	2184.91	MEAN	5.99	MAX	37	MIN	0.73	AC-FT	4330	
WTR YR	2010	TOTAL	6987.75	MEAN	19.1	MAX	189	MIN	0.96	AC-FT	13860	

MAX DISCH: 266 CFS AT 19:45 ON Jul. 04,2010 GH 7.6 FT. SHIFT 0.01 FT.

MAX GH: 7.6 FT. AT 19:45 ON Jul. 04,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06739500 BUCKHORN CREEK NEAR MASONVILLE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
Water Year 2010

Location.--	Lat. 40°25'20", Long. 105°13'33", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T.5 N., T.70 W., Larimer County.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron shaft encoder and a high data rate Sutron 8210 data collection platform (DCP) in a 4 foot by 4 foot concrete shelter and concrete well with two three-inch inlets at a concrete lined canal section. A standalone Sutron Stage Discharge Recorder (SDR) is also in the shelter and serves as backup. An electric tape gage (ETG) is the primary reference with no supplemental staff gage. AC power is available at the gage and heaters are used to keep the stilling well from freezing in winter months. The station is maintained in cooperation with the State of Colorado Division of Water Resources (DWR), United States Bureau of Reclamation (USBR) and Northern Colorado Water Conservancy District (NCWCD). This gage is a component of the Colorado Big Thompson (C-BT) project.
Hydrologic Conditions.--	Trapezoidal concrete canal with regulated releases from Flatiron Reservoir (HFCFLT CO) and Dille Tunnel (DILTUNCO). The Charles Hansen Feeder Canal conveys water released from Flatiron Reservoir and occasionally diverted water from the Big Thompson River via Dille Tunnel to terminal storage at Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel.
Gage-Height Record.--	The primary record is hourly averages of logged 15-minute SDR data with satellite data as back up. The record is complete and reliable. Instrument calibration was supported by 267 visits by NCWCD, USBR and DWR personnel to the gage this year showing good agreement between sensors and the base gage throughout the year, with the exception of March 26-31, 2010 when site observations of the SDR instrument did not agree well with the base gage for unknown cause. Shaft encoder observations showed good agreement during this period; therefore backup record data were used without loss of accuracy. During the course of development of this record, comparison between the two data sets and hydrographs thereof showed deviation, indicating some impediment of the shaft encoder movement. On December 29, 2010 a visit to the gage discovered that the shaft encoder float and counter weight were interacting (weight sitting on top of the float and vice versa). This issue was corrected at the time of observation. No adverse impediment was observed with the SDR's float and counter weight orientation, so the SDR data were upgraded to the primary data set. Deviation of the two data sets through the above interaction is obvious when overlaying the two hydrographs. Shaft encoder data were heavily discounted when observed. Outside of these relatively infrequent and short duration periods data comparison between the two instruments is well within allowable tolerances. All other significant (> +/- 0.02 feet) variances were determined to be caused by significant stage changes occurring as a result of the USBR's operations. One instrument correction of -0.01 feet was made occurring on March 5, 2010 but not applied to the record. A site visit made earlier that day showed the SDR reading accurately with respect to the base gage. Therefore, it is assumed that the actual correction was less than -0.01 feet in magnitude, and application of the correction would not yield a significant change to the record.
Datum Corrections.--	Levels were last run on May 31, 2007.
Rating.--	The low flow control is the first fire protection check structure in the canal downstream from the gage. The control for mid to high flows is the canal itself. Rating No. 17, in use since 2005 was continued this year and is defined by measurement from 13 to 503 cfs. Two discharge measurements (Nos. 815-816) were made this year ranging in discharge from 52.9 to 470 cfs. The peak flow of 538 cfs occurred at 0745 May 28, 2010 at a gage height of 6.61 feet with a zero shift. It exceeded measurement number 815 made June 2, 2010 by 0.58 feet of stage and 68 cfs.
Discharge.--	The rating was applied directly to gage height record to compute discharge. Historically, measurements within +/-5% of the rating have been adjusted to zero as per agreement with DWR, NCWCD and USBR. Measurements showed unadjusted shifts +0.01 ft and 0.00 ft. No. 815 was less than one percent from the rating and was adjusted to zero shift. Discharge measurement made in the fall of WY 2011, during an indirect DILTUNCO measurement effort showed more significant variation between computed discharges and the HFCBBSCO17 rating discharge values than has been experienced in previous years. It is unclear at this time the causation of these discrepancies. Regardless, a similar measurement effort has been coordinated with the USBR, NCWCD and DWR tentatively scheduled for the spring of 2011. Dependent upon the outcome of these future measurements, rerating of this structure may be warranted.
Special Computations.--	During periods of no flow, the sensor readings will fall below zero due to draining of the canal and stilling well. Negative stage values are manually edited to 0.00 feet (no edits were required in processing the WY 2010 record). The SDR unit does not automatically correct for Daylight Savings Time (DLS) adjustments. The SDR log was manually edited to compensate for DLS adjustments prior to being evaluated.
Remarks.--	The record is good. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	The ETG should be replaced and levels run in WY2011. Documentation of the new reference elevation should be made to all DWR, USBR and NCWCD documents.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON

RATING TABLE--

HFCBBSO17 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

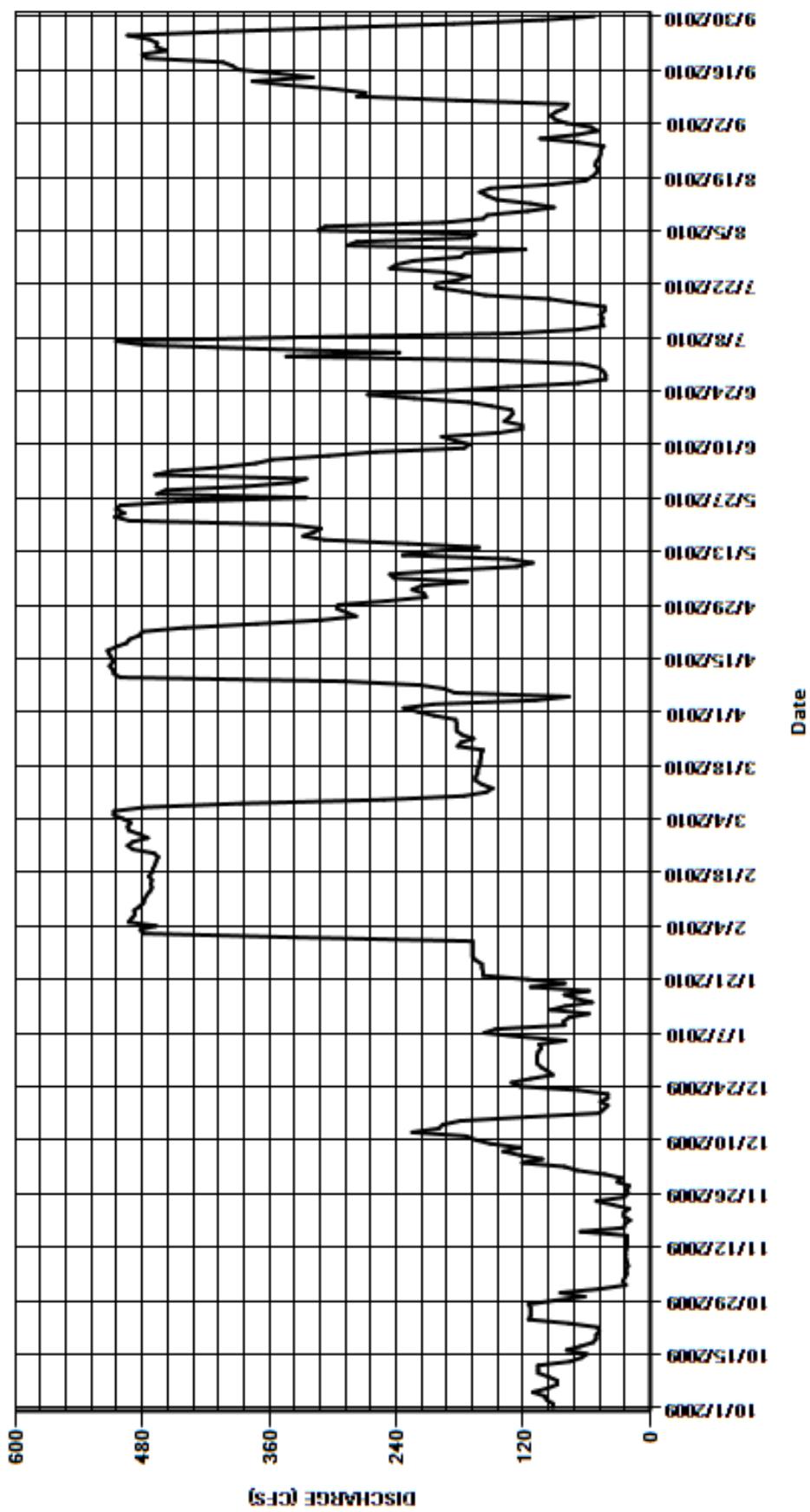
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	48	43	107	334	493	219	212	325	64	287	56
2	92	23	69	106	479	494	233	214	468	150	277	79
3	98	26	81	103	482	491	205	225	452	344	172	90
4	100	24	121	105	467	498	109	216	406	237	165	94
5	111	22	102	80	493	507	77	173	373	371	314	89
6	97	23	123	123	490	507	185	242	357	479	307	80
7	88	21	139	157	487	479	194	246	304	505	196	78
8	88	22	123	146	488	387	218	193	259	334	158	183
9	96	23	151	81	483	252	289	126	176	131	154	277
10	106	23	165	82	479	176	501	111	171	68	116	269
11	106	23	174	77	478	155	507	135	185	44	91	300
12	106	22	225	58	476	149	508	234	197	46	113	344
13	76	22	200	94	473	159	511	207	143	45	145	376
14	65	22	196	80	471	165	508	162	121	47	154	319
15	60	22	179	55	472	165	509	229	121	43	161	351
16	79	66	116	70	471	163	511	308	138	43	151	389
17	66	25	48	81	474	163	513	328	133	71	92	395
18	54	24	44	58	471	161	505	318	130	95	61	404
19	51	19	40	113	470	161	495	311	131	156	55	476
20	51	25	47	81	468	160	492	342	150	177	51	480
21	48	25	40	116	467	160	483	492	172	203	49	457
22	50	20	40	158	465	158	480	506	223	203	52	467
23	77	35	68	158	469	182	440	497	267	182	51	466
24	115	51	123	159	489	179	372	505	192	171	48	474
25	113	25	131	159	494	167	311	501	135	194	47	494
26	113	21	113	165	489	178	278	448	68	246	47	400
27	113	22	92	168	475	183	287	325	42	240	44	296
28	115	20	97	168	483	183	296	466	42	224	68	186
29	90	31	103	168	---	183	295	458	44	179	104	102
30	62	27	107	168	---	184	249	382	48	175	69	53
31	85	---	107	168	---	204	---	338	---	118	50	---
TOTAL	2663	802	3407	3612	13237	7846	10780	9450	5973	5585	3849	8524
MEAN	85.9	26.7	110	117	473	253	359	305	199	180	124	284
AC-FT	5280	1590	6760	7160	26260	15560	21380	18740	11850	11080	7630	16910
MAX	115	66	225	168	494	507	513	506	468	505	314	494
MIN	48	19	40	55	334	149	77	111	42	43	44	53
CAL YR	2009	TOTAL	58824.00	MEAN	161	MAX	510	MIN	0	AC-FT	116700	
WTR YR	2010	TOTAL	75728	MEAN	207	MAX	513	MIN	19	AC-FT	150200	

MAX DISCH: 538 CFS AT 07:45 ON May. 28,2010 GH 6.61 FT. SHIFT 0 FT.

MAX GH: 6.61 FT. AT 07:45 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

Water Year 2010

Location.--	Lat 40°25'11", long 105°13'30", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T.5 N., R.70 W., Larimer County. Hydrologic unit 10190006, on right bank of Charles Hansen Feeder Canal Wasteway, at canal trifurcation, 0.25 miles south of US Route 34, and 7 miles west of Loveland, Colorado.
Drainage and Period of Record.--	N/A.
Equipment.--	Design Analysis H-334 shaft encoder connected to a Sutron Data Collection Platform (DCP) in a four foot by four foot concrete shelter and concrete well at a 15 foot modified concrete Parshall flume. A Vaisala WXT510 multi-parameter weather sensor is also monitored by the DCP. A standalone Sutron Stage Discharge Recorder (SDR) is also present. An electric tape gage is the primary reference gage with a supplemental staff gage located on the left wing wall of the flume at the Ha location. The well is connected to the flume by two 2-inch inlets with flushing equipment. A timber measurement bridge is located upstream of the Ha location in the converging section of the flume. AC power is available on site. The gage is operated in cooperation with Colorado Division of Water Resources (CDWR), United States Bureau of Reclamation (USBR) and Northern Colorado Water Conservancy District (NCWCD) as a component of the Colorado Big Thompson (C-BT) project.
Hydrologic Conditions.--	Semi controlled release often experiencing rapid changes and transient flow. The Charles Hansen Feeder Canal conveys water from Flatiron Reservoir to Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel. The HFCWASCO structure serves double duty as both a delivery structure as well as a safety feature for the Hansen Feeder Canal System within the C-BT system. As a delivery structure, due to the placement of the Big Thompson Power Plant (BTPPMCCO) and the Handy Ditch company's diversion structure, water cannot be routed through the BTPPMCCO structure and then subsequently delivered to the Handy Ditch. Additionally, when the BTPPMCCO plant is unavailable for power generation water can be routed through the HFCWASCO structure for subsequent diversion downstream of the HFCWASCO and Big Thompson River's confluence point. In addition to performing as a water delivery structure, the HFCWASCO structure is used as a safety mechanism. In the event that the BTPPMCCO plant were to trip offline, water intended to pass through the BTPPMCCO plant would quickly overtop the Hansen Feeder Canal upstream from the plant. Therefore, the Supervisor Control and Data Acquisition (SCADA) system will open three slide gates located in the Hansen Feeder Canal conveying water into the wasteway. The same event would occur if a blockage was detected in the Big Thompson Siphon located immediately downstream from the HFCWASCO diversion point. In the event that the SCADA procedure were to fail or be delayed in slide gate activation, a siphonic spillway also located immediately upstream of the Big Thompson Siphon radial gate can convey water into the wasteway structure. However, water introduced via the siphonic spillway comes in below the flume's crest and therefore cannot be quantified by this structure.
Gage-Height Record.--	The primary record is hourly averages of 15-minute logged data taken from the SDR with telemetered data as back up. The record is complete and reliable. The shaft encoder data set appears to have had an erroneously introduced DCP offset of +0.01 feet. Unable to confirm this, the SDR record has been upgraded to be the primary data set. Frequent visits by NCWCD, USBR and DWR personnel show good agreement between sensors and base gages. Two slight discrepancies occurred regarding daily maximum and minimum data recorded between the two sensors. Both discrepancies were associated with rapid flow change events. Both instruments recorded the event but disagreed in the magnitude of the event. The differences are assumed to be due to the SDR's clock drifting slightly thereby recording values slightly outside the same interval that the DCP records values. This slight timing issue is compounded by the transient nature of this structure and these events. Zero flow is determined operationally. Due to the placement of the inlets of the structure, residual water remains in the stilling well thereby recording false positive stage values following dewatering of the structure. In previous years, it has been determined that sustained stages of 0.05 feet and below is a resultant of residual water in the stilling well. This hypothesis was confirmed by an in-flume inspection on April 3, 2008. One instrument calibration correction of -0.01 feet was made on April 30, 2010 but was not applied to the record. Visits made by NCWCD staff prior to the correction showed good agreement between the base gage and the instrument. Therefore, it is assumed that the correction was less than -0.01 feet in total magnitude and application of the correction would not yield a significant change to the record or the accuracy thereof. Peak stage value of 3.20 feet was recorded by the SDR at 0800 June 8, 2010. The shaft encoder showed the same value occurring at 0745 June 8, 2010. However, the shaft encoder recorded a peak stage of 3.21 feet occurring at 0415 June 9, 2010, which has been discounted due to the suspected +0.01 ft DCP offset.
Datum Corrections.--	Levels were last run on April 3, 2008 when the electric tape gage was replaced and re-indexed to an elevation of 15.095 feet. The gage and control are both stable and do not require frequent level validation.
Rating.--	The control is a modified 15-foot Parshall Flume with upstream baffle box and is in good condition. Rating No. 2 (HFCWASCO02) is a standard 15-foot Parshall rating up to a gage-height of 2.10 feet and customized upward based on measurements made prior to 1972. An illustration of this break between ratings is provided. No discharge measurements were made during the 2010 water year. The peak discharge of 394 cfs occurred at 0800 June 8, 2010 at a gage height of 3.20 feet with a shift of 0.00 ft.
Discharge.--	Per agreement with the USBR, NCWCD and CDWR measurements within 5% of the rating have been adjusted to zero. Open water measurements made in previous years showed positive shifting; however, last year's measurement showed slight negative shifting. Previous measurements Nos. 107, 108 and 109 made in the 2006, 2007, and 2009 water years were adjusted to the rating requiring adjustments of 3%, 4%, and -2% respectively. The rating was applied directly to the gage height record to compute discharge.

Special Computations.-- Assumed PZF is 0.05 feet of stage recorded at the stilling well. The rating table used for discharge computation has been edited to zero all discharge values at and below 0.05 feet of stage. The SDR log was manually edited for Daylight Savings (DLS) time adjustments. Time adjustments were made to the SDR instrument however the adjustments were made several days following the prescribed change; thereby, requiring manual adjustment of logged time and stage values in the intervening days until the instrument was physically adjusted.

Remarks.-- The record is good. Any flows introduced to this structure via the siphonic spillway were not and could not be recorded by this structure. Record developed by Russell V. Stroud .

Recommendations.-- Mass balance computations of the Hansen Feeder Canal System may be able to identify and quantify siphonic spillway usage. This has not been evaluated by CDWR as of yet. A safety evaluation of the timber measurement bridge by a qualified engineer should be preformed prior to performing any further discharge measurements from it.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

RATING TABLE-- HFCWASCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	13	26
2	0	0	0	0	0	0	0	0	0	0	15	9.8
3	0	0	0	0	0	0	0	0	7.7	0	11	4.1
4	0	0	0	0	0	0	0	0	3.2	0	3.6	6.8
5	0	0	0	0	0	0	0	0	0	0	0	9.8
6	16	0	0	0	0	0	0	0	1.9	0	0	11
7	24	0	0	0	0	0	0	0	19	0	0	17
8	18	0	0	0	0	0	0	0	122	0	9.4	20
9	4.4	0	0	0	0	0	0	0	59	0	9.3	20
10	0	0	0	0	0	0	0	0	0	0	9.3	20
11	0	0	0	0	0	0	0	0	0	0	9.3	21
12	0	0	0	0	0	0	0	0	0	0	9.3	22
13	27	0	0	0	0	0	0	0	0	0	0	2.7
14	12	0	0	0	0	0	0	0	0	0	0	16
15	0	0	0	0	0	0	0	0	0.12	0	0	23
16	0	0	0	0	0	0	0	0	0	0	0	21
17	0	0	0	0	0	0	0	0	0	0	0	21
18	0	0	0	0	0	0	0	0	0	0	0	21
19	44	0	0	0	0	0	1.9	0	0	0	0	67
20	48	0	0	0	0	0	4.2	0	0	0	0	86
21	38	0	0	0	0	0	10	0	0	0	0	41
22	56	0	0	0	0	0	13	8.1	0	0	0	22
23	16	0	0	0	0	0	48	0.63	0	0	48	21
24	0	0	0	0	0	0	71	0	0	0	68	21
25	0	0	0	0	0	0	67	0	0	6.7	68	12
26	0	0	0	0	0	0	54	0	0	9.1	68	13
27	0	0	0	0	0	0	48	0	0	8.5	68	72
28	0	0	0	0	0	0	39	0.17	24	8.2	68	95
29	0	0	0	0	---	0	35	0	144	8.4	69	70
30	0	0	0	0	---	0	62	0	62	9.9	80	59
31	0	---	0	0	---	0	---	0	---	9.9	67	---
TOTAL	303.40	0.00	0.00	0.00	0.00	0.00	453.10	8.90	442.92	60.70	702.90	874.9
MEAN	9.79	0	0	0	0	0	15.1	0.29	14.8	1.96	22.7	29.2
AC-FT	602	0	0	0	0	0	899	18	879	120	1390	1740
MAX	56	0	0	0	0	0	71	8.1	144	9.9	80	95
MIN	0	0	0	0	0	0	0	0	0	0	0	4.1

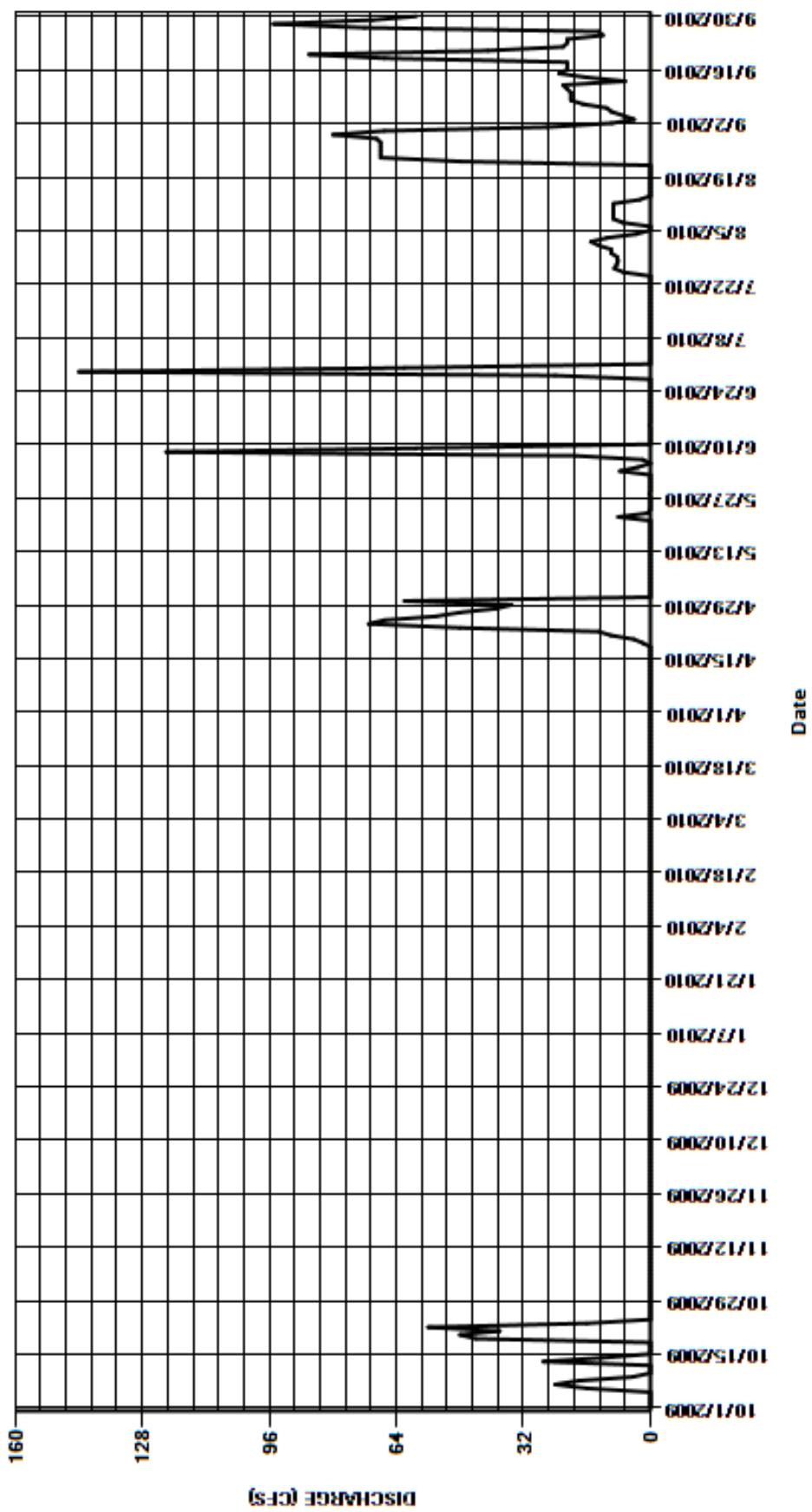
CAL YR	2009	TOTAL	2411.46	MEAN	6.61	MAX	247	MIN	0	AC-FT	4780
WTR YR	2010	TOTAL	2846.82	MEAN	7.8	MAX	144	MIN	0	AC-FT	5650

MAX DISCH: 394 CFS AT 08:00 ON Jun. 08,2010 GH 3.2 FT. SHIFT 0 FT.

MAX GH: 3.2 FT. AT 08:00 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
Water Year 2010

Location.--	Lat 40°25'15", long 105°13'30", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T.5 N., R.70 W., Larimer County, Hydrologic unit 10190006, on right bank of Big Thompson River, .25 miles downstream of canyon mouth, 0.25 miles north of US Route 34, and 7 miles west of Loveland, Colorado.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron 8210 Data Collection Platform (DCP) connected to an ultrasonic flow meter placed on the upper scroll casing of the power turbine. A graphical discharge recorder is also connected to the flow meter but has been disabled over the last few years. Power plant facilities are operated and maintained by the United States Bureau of Reclamation (USBR). Satellite telemetry equipment is maintained by Colorado Division of Water Resources (CDWR) staff.
Hydrologic Conditions.--	Controlled release from the Charles Hansen Feeder Canal to the Big Thompson River. Waters transmitted via the Power Plant facility originated at or in part from either Flatiron Reservoir or the Dille Tunnel (DILTUNCO) diversion, both of which convey water to the Hansen Feeder Canal upstream from the Power Plant. Waters passed through the Power Plant facility enter the Big Thompson River downstream from the Big Thompson at Canyon Mouth (BTCANYCO) gage, Charles Hansen Feeder Canal Wasteway to Big Thompson River (HFCWASCO) delivery point, and the Handy Ditch diversion structure (WDID: 0400521).
Gage-Height Record.--	The primary record is hourly averages of recorded and telemetered 15-minute discharge values measured from the ultrasonic instrument. The record is complete and reliable, except for March 23, 2010, when there were multiple hours of missing or unreported values. The hydroelectric unit was not operable during this period. Values were adjusted to zero without loss of accuracy. And, June 13-15, 2010, when the ultrasonic flow meter suffered an unknown failure and was reporting erroneous values. Erroneous values were filled in directly from USBR accounting forms and correlated to USBR water scheduling reports. When the power plant is offline the flow meter generally does not report zero flow values. Rather, values ranging from -2 to 8 cfs are reported by the instrument. These values are erroneous and occurred during periods when the Power Plant facility was winterized or otherwise offline. Erroneous positive and negative values reported were adjusted to zero without loss of accuracy.
Datum Corrections.--	Not applicable.
Rating.--	Since the primary data is discharge, no rating is needed. However, the rating portion of the record development program is used to convert all reported discharges that are less than 5 cfs to zero. Thus, erroneous small values that populate the primary data set when the plant is off are computed as zero flow. A ultrasonic flow meter is installed on the turbine's upper scroll casing. No calibration information is available on the meter. However, available information on the meter indicates that the meter should be within two percent of actual flow. The power plant discharges directly into the river; water can also be diverted and delivered to the river by either the HFCWASCO or Handy Ditch structures immediately upstream from the power plant. Thus, there are no opportunities to perform comparison measurements. The peak flow of 408 cfs occurred at 0030 June 16, 2010.
Discharge.--	Discharge for the year was computed from the telemetered flow meter data. Transmitted values were checked against water orders issued by the USBR as well as USBR monthly accounting information provided to the CDWR office. Computed values were found to be in excellent agreement with USBR accounting. Negligible daily (+/- 1cfs) discrepancies occur between the computed record evaluated here and USBR provided accounting. Discrepancies are assumed to be caused by precision or rounding differences between the two methods of computation. Maximum monthly differences totaled less than 10 cfs-d per month.
Special Computations.--	Indirect validation method of the power plant record began in WY 2006 when a mass balance calculator was developed to help quantify the individual gage accuracies and to monitor diversions to and deliveries from the Charles Hansen Feeder Canal system. The calculations indicated that some submergence and variable backwater issues existed at Hansen Feeder Canal below Flatiron Reservoir (HFCFLTCO) gage. In the 2008 water year the USBR purchased and installed an Acoustic Doppler Velocity Meter (ADVM) for the HFCFLTCO gage. Mass Balance computations made since installation of the ADVM unit have shown good agreement with all gages in the Hansen Feeder Canal system, including the power plant.
Remarks.--	The record is good, except for June 13-15, 2010 which is considered fair when the ultrasonic meter was faulty. Despite the inability for direct confirmatory discharge measurements, indirect measurement methods show the instrument to be accurate. Record developed by Russell V. Stroud.
Recommendations.--	Mass balance computations need to be continued to ensure operational accuracy. The velocity indexed rating at the HFCFLTCO gageing station needs to be further defined and refined. Once complete, a robust mass balance analysis should be performed on the Charles Hansen Feeder Canal system.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH

RATING TABLE--

STCONVERT USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	152	0	391	308	268
2	0	0	0	0	0	0	0	156	0	391	288	270
3	0	0	0	0	0	0	0	161	0	391	293	264
4	0	0	0	0	0	0	0	139	0	389	236	241
5	0	0	0	0	0	0	0	124	0	392	214	228
6	0	0	0	0	0	0	0	117	168	334	293	234
7	0	0	0	0	0	0	0	115	277	283	314	227
8	0	0	0	0	0	0	0	112	339	278	286	218
9	0	0	0	0	0	0	0	32	319	362	272	192
10	0	0	0	0	0	0	0	0	392	373	254	185
11	0	0	0	0	0	0	0	0	393	301	263	191
12	0	0	0	0	0	0	0	0	394	267	242	194
13	0	0	0	0	0	0	0	0	390	275	226	57
14	92	0	0	0	0	0	0	0	390	280	225	122
15	166	0	0	0	0	0	0	0	390	273	219	172
16	199	0	0	0	0	0	0	0	392	283	211	170
17	206	0	0	0	0	0	0	0	390	267	258	169
18	199	0	0	0	0	0	0	0	390	239	275	165
19	119	0	0	0	0	0	0	0	392	225	268	49
20	74	0	0	0	0	0	0	0	390	226	264	0
21	32	0	0	0	0	0	0	0	392	225	267	75
22	0	0	0	0	0	0	0	0	392	225	254	115
23	0	0	0	0	0	0	0	0	313	245	240	119
24	0	0	0	0	0	0	0	0	308	252	233	117
25	0	0	0	0	0	0	0	0	363	221	253	117
26	0	0	0	0	0	0	0	0	387	196	261	130
27	0	0	0	0	0	0	0	0	389	196	253	40
28	0	0	0	0	0	0	0	107	390	193	227	0
29	91	0	0	0	---	0	0	152	253	189	225	0
30	116	0	0	0	---	0	62	44	327	204	208	0
31	30	---	0	0	---	0	---	0	---	263	244	---
TOTAL	1324.00	0.00	0.00	0.00	0.00	0.00	62.00	1411.00	8920.00	8629	7874	4329.00
MEAN	42.7	0	0	0	0	0	2.07	45.5	297	278	254	144
AC-FT	2630	0	0	0	0	0	123	2800	17690	17120	15620	8590
MAX	206	0	0	0	0	0	62	161	394	392	314	270
MIN	0	0	0	0	0	0	0	0	0	189	208	0

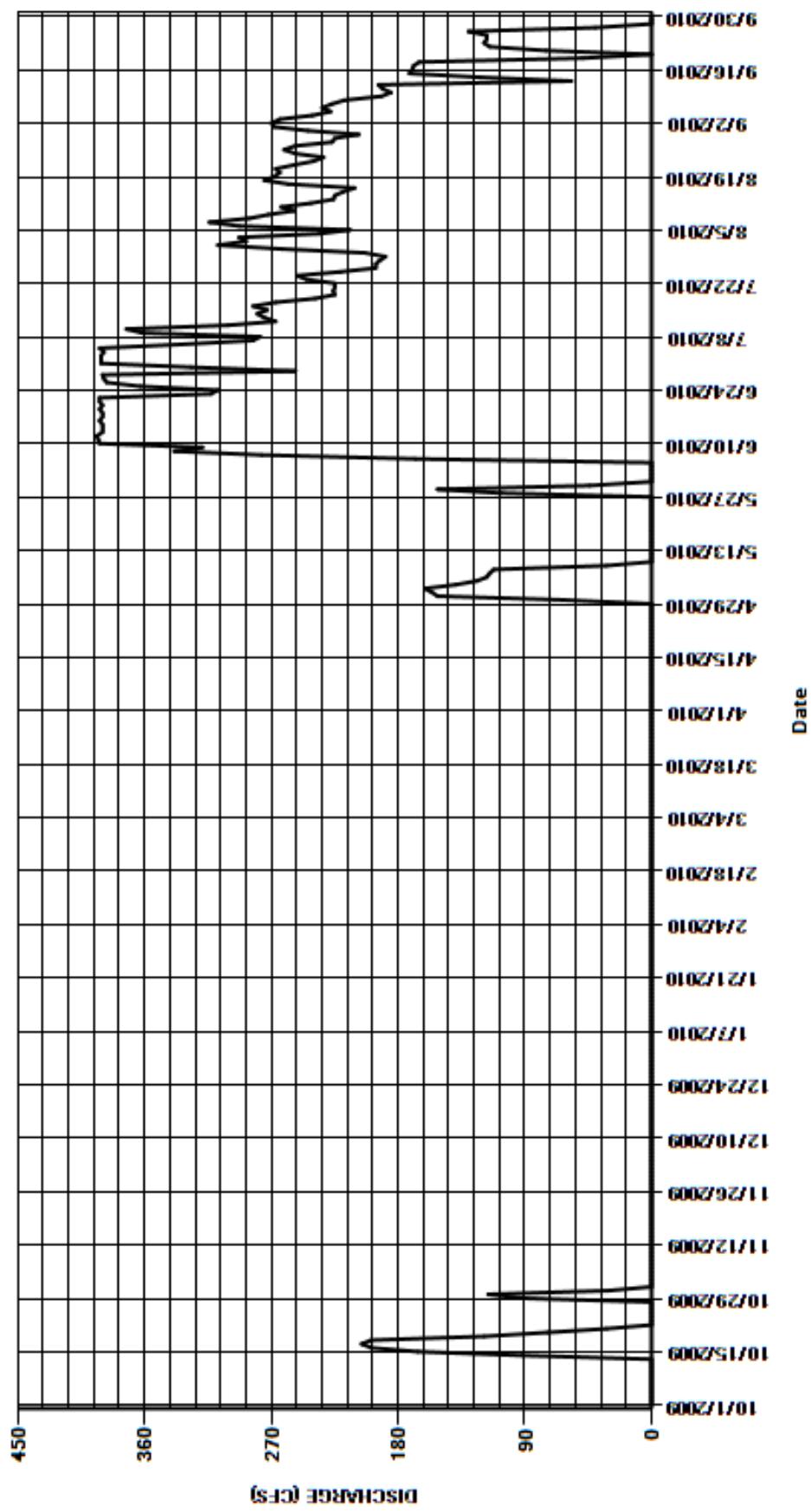
CAL YR	2009	TOTAL	33957.10	MEAN	93	MAX	498	MIN	0	AC-FT	67350
WTR YR	2010	TOTAL	32549.00	MEAN	89.2	MAX	394	MIN	0	AC-FT	64560

MAX DISCH: 408 CFS AT 00:30 ON Jun. 16,2010

MAX GH: FT. (N/A)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK FEEDER CANAL NEAR LYONS
Water Year 2010

Location.--	Lat 40°12'58", long 105°15'28", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 1 Data Collection Platform (DCP) in a rectangular 6 ft by 8 ft precast concrete shelter at a 10 foot concrete Parshall flume with Ha stilling well. In addition to the above instrumentation the Northern Colorado Water Conservancy District (NCWCD) operates a Sutron 56-0540 incremental shaft encoder (record may be available upon request of the NCWCD). The primary reference is an electric tape gage (ETG) located in the shelter with a supplemental staff located at the Ha location on the right wing wall of the flume. The gage is operated in cooperation with the NCWCD and the State of Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	The Boulder Feeder Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek drainages. Water is measured at the Saint Vrain Supply Canal (15-foot Parshall flume) at Lyons, CO (SVSLYOCO) before bifurcating. Water bifurcating can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons CO (SVCLYOCO) gage and/or can be delivered to the Boulder Feeder Canal (BFCLYOCO) via an inverted siphon under Hwy 66. Water delivered into the BFCLYOCO daylights approximately 200-feet upstream in a linear fashion (allowing sufficient stilling) from the 10-foot Parshall flume. After passing through the Parshall flume water again enters an inverted siphon before being conveyed to terminal storage in Boulder and Coal Ridge Reservoirs through both open and buried sections of canal. Back water from the downstream siphon is not an issue.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered SDR data with NCWCD data as backup. The record is complete and reliable, except for several positive hourly stage values were recorded on November 1, 2009 after the canal had been shut down for the winter. Positive stage during this period are suspected to be residual water draining from the siphon and represents no active diversion of water. Instrument calibration was supported by 131 visits made by NCWCD and CDWR staff to the gage this year. One instrument correction was made on May 12, 2010 which was associated with the initial May startup of the canal system. NCWCD staff noted a -0.02 foot difference between the base gage and the SDR on May 7, 2010 which transitioned to an applied -0.03 foot correction made to the instrument on May 12, 2010. Corrections indicated by comparing average GH's between primary and back-up data were nearly identical to the pro-rated corrections. Thus, corrected DWR average GH's exactly matched those of NCWCD. This structure is not operated in winter months; typically the structure is not in use from November through May. Diversions were discontinued on October 31, 2009 and resumed again on May 7, 2010. The DCP was winterized on November 23, 2009 and reactivated on April 22, 2010. In preparation of the winter the NCWCD removes the instrument floats from the stilling well prior to pumping the stilling well out.
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume and adjusted by NCWCD personnel accordingly. There is no indication that NCWCD personnel performed levels this year. However, levels were run by DWR staff in the 2006 water year and found to be within allowable tolerances.
Rating.--	The control is a 10 foot Parshall flume. Rating No. 2, a non-standard rating, in use since October 1, 1977, compensates for abnormal approach conditions and was continued this year. Moss growth upstream of the flume does occur in late July through September which can cause velocity loss in the approach section and may cause negative shifting. Get-away conditions are good and submergence is not a problem. Two discharge measurements (Nos. 166-167) were made this water year ranging in discharge from 16.2 to 132 cfs. Discharge measurements made this year as well as two observations of zero flow cover the range in stage experienced this year. The peak flow of 194 cfs occurred at 1245 August 30, 2010 at a gage height of 2.67 feet with a shift of 0.00ft. It exceeded Msmt. No. 167 made August 17, 2010 by 0.57 feet of stage and 62 cfs.
Discharge.--	Discharge measurements within 5% of the rating have historically been adjusted to the rating as per agreement with NCWCD and the Water Commissioner. Both measurement made this water year showed unadjusted shifts of 0.00 feet. Msmt. Nos. 165 and 168 made preceding and following WY2010 required adjustments of 1% and -3%, respectively. Discharge was computed by applying the rating directly to gage height record.
Special Computations.--	Direct comparison of BFCLYOCO computed discharge values to those at the SVSLYOCO structure are made. Computed discharge at the BFCLYOCO gage should never exceed those at the SVSLYOCO gage. Discharge for the period of residual positive stage values recorded on November 1 2009 was set to zero.
Remarks.--	The record is good. Computed discharge values from June 5-10, 2010 exceeded those from the SVSLYOCO gage. On June 6 and 7, 2010 water was observed to be entering the bifurcation from the high stage flows in Saint Vrain Creek (video on file). NCWCD was notified of this issue on June 7, 2010 and corrected the bifurcation manifold orientation shortly thereafter. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Levels should be run in the 2011 water year to verify ETG stability and flume levelness. Opportunities to perform discharge measurements at the low and high stage extremes should be continued to be watched for. An Acoustic Doppler Current Profiler (ADCP) vs. current meter measurement validation exercise could be attempted. Five-minute NCWCD GH's used for back-up need to be obtained yearly from Patti Gill at NCWCD in a CSV file.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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BOULDER CREEK FEEDER CANAL NEAR LYONS

RATING TABLE--

BFCLYOCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	0	0	0	0	0	0	0	1.7	17	91	189
2	47	0	0	0	0	0	0	0	9.2	12	74	190
3	46	0	0	0	0	0	0	0	9	12	77	191
4	47	0	0	0	0	0	0	0	9.6	14	83	188
5	42	0	0	0	0	0	0	0	17	14	78	179
6	57	0	0	0	0	0	0	44	31	13	61	164
7	76	0	0	0	0	0	0	29	27	13	70	156
8	74	0	0	0	0	0	0	4.5	20	11	110	163
9	73	0	0	0	0	0	0	4.3	20	10	118	166
10	74	0	0	0	0	0	0	4.5	20	8.6	108	155
11	68	0	0	0	0	0	0	5.5	16	9.2	106	151
12	57	0	0	0	0	0	0	5.8	13	13	116	150
13	80	0	0	0	0	0	0	6.2	12	12	121	150
14	100	0	0	0	0	0	0	5.9	11	14	119	137
15	102	0	0	0	0	0	0	5.8	8.4	16	125	118
16	97	0	0	0	0	0	0	5.1	7.2	24	136	97
17	96	0	0	0	0	0	0	5.4	7.2	20	135	82
18	96	0	0	0	0	0	0	5.7	8.6	19	125	78
19	69	0	0	0	0	0	0	5.5	12	18	132	79
20	38	0	0	0	0	0	0	4.3	13	27	149	78
21	42	0	0	0	0	0	0	1.4	16	37	149	76
22	50	0	0	0	0	0	0	1.7	15	37	147	74
23	50	0	0	0	0	0	0	1.5	15	37	145	68
24	46	0	0	0	0	0	0	1.1	15	38	149	67
25	44	0	0	0	0	0	0	1.2	15	32	153	65
26	41	0	0	0	0	0	0	1.7	19	39	141	60
27	38	0	0	0	0	0	0	1.5	15	54	138	60
28	34	0	0	0	0	0	0	1.4	16	56	148	52
29	17	0	0	0	---	0	0	1.2	15	61	150	61
30	4.4	0	0	0	---	0	0	7.5	15	75	172	82
31	8.8	---	0	0	---	0	---	6	---	94	193	---
TOTAL	1766.2	0.00	0.00	0.00	0.00	0.00	0.00	167.70	428.9	856.8	3819	3526
MEAN	57	0	0	0	0	0	0	5.41	14.3	27.6	123	118
AC-FT	3500	0	0	0	0	0	0	333	851	1700	7570	6990
MAX	102	0	0	0	0	0	0	44	31	94	193	191
MIN	4.4	0	0	0	0	0	0	0	1.7	8.6	61	52

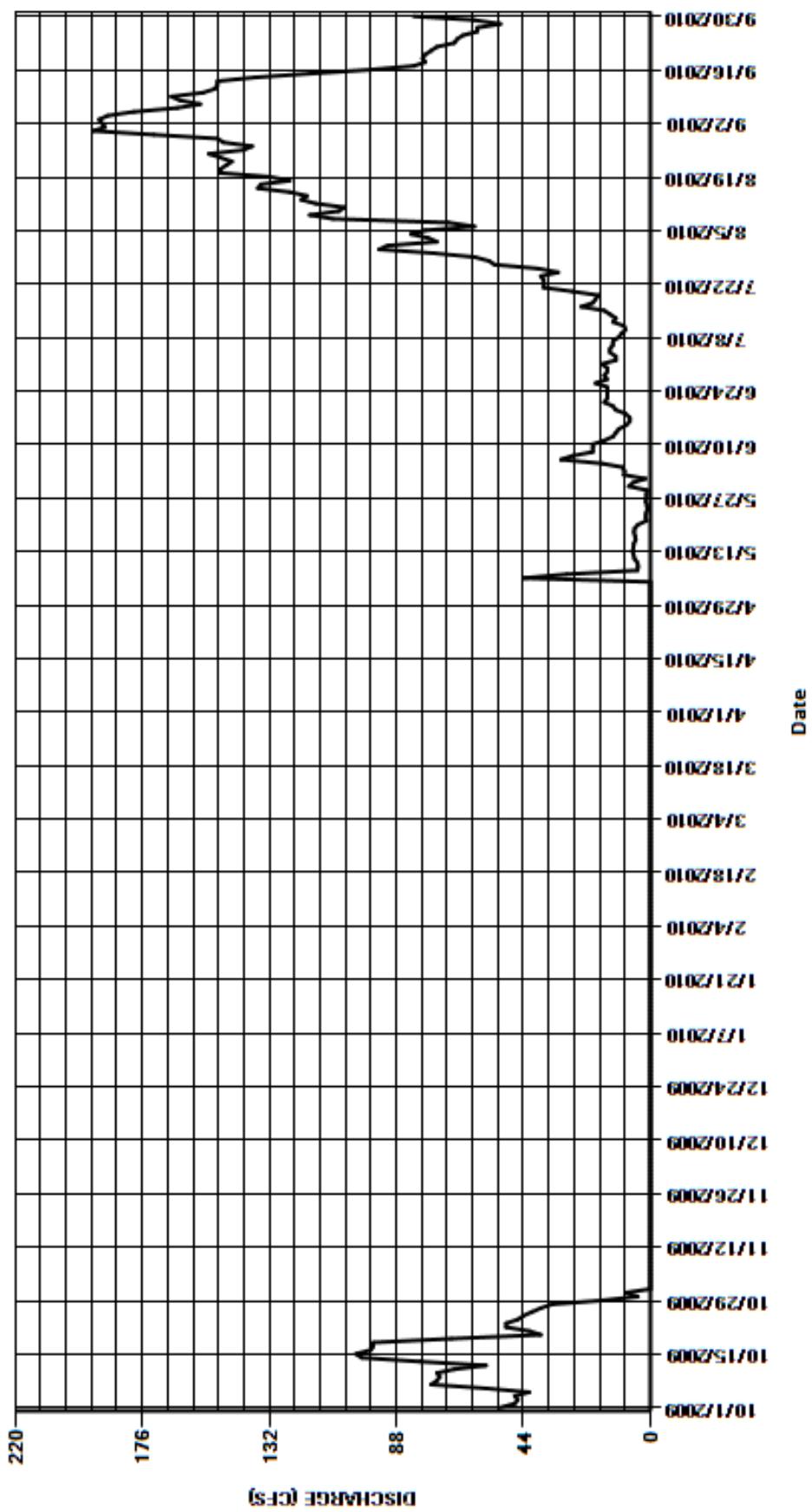
CAL YR	2009	TOTAL	10049.60	MEAN	27.5	MAX	186	MIN	0	AC-FT	19930
WTR YR	2010	TOTAL	10564.60	MEAN	28.9	MAX	193	MIN	0	AC-FT	20950

MAX DISCH: 194 CFS AT 12:45 ON Aug. 30,2010 GH 2.67 FT. SHIFT 0 FT.

MAX GH: 2.67 FT. AT 12:45 ON Aug. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK FEEDER CANAL NEAR LYONS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO
Water Year 2010

Location.--	Lat 40°13'05", long 105°15'35", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink Data Collection Platform (DCP) in a 36-inch corrugated metal pipe shelter overtop a 3-foot square concrete stilling well at a 15-foot concrete Parshall flume. In addition to the above instrumentation the Northern Colorado Water Conservancy District (NCWCD) operates a Sutron incremental shaft encoder and Stevens Type A continuous chart recorder (record may be available upon request of the NCWCD). The primary reference is an electric tape gage (ETG) located on the instrument shelf with a supplemental staff gage located at the Ha location on the right wing wall of the flume. A foot bridge spans the flume with its upstream edge placed at the Ha location. The gage is operated in cooperation of the NCWCD and the State of Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	The Saint Vrain Supply Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek basins. Releases are measured at the Saint Vrain Supply Canal at Lyons CO (SVSLYOCO) gage before bifurcation. Bifurcated water can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons CO (SVCLYOCO) gage and/or delivered to the Boulder Feeder Canal (BFCLYOCO) for terminal storage in Boulder Reservoir. The diversionary point is located downstream from the SVSLYOCO gage below an inverted siphon under Hwy 66. There are several minor diversions along the Saint Vrain Supply Canal before the SVSLYOCO gage (15-foot Parshall flume) location. Water conveyed from Carter Reservoir daylight approximately 0.25 miles upstream from the flume on a hillside due north of the gage. From this point the canal drops down a steep gradient chute into the flume's forebay. A small diversionary point for water deliveries to the Supply Ditch is also located in the SVSLYOCO forebay. Due to the tremendous velocity achieved by the water dropping down the chute, surging flow and unsteady stage are encountered by the SVSLYOCO 15 foot Parshall flume. Backwater from the inverted siphon immediately downstream from the flume has not been observed.
Gage-Height Record.--	The primary record is hourly averages of 15-minute telemetered SDR data with NCWCD shaft encoder as backup. The record is complete and reliable, except for stage values of 0.08 feet and below occurring from October 31-November 2, 2009. In previous years, residual positive stage with observations of no flow has been observed to occur at a stage of 0.08 feet and below. Therefore, sustained stage values of 0.08 feet and below are believed to be erroneous and are treated as zero. During October 1-21, 2009 the daily count of telemetered values was 95 values rather than 96. Through further investigation, it was determined that the SDR conducted a routine daily at 23:59 (GMT) to compute and log the average daily stage, daily volume and battery voltage. This computational routine caused the SDR to become unavailable to report stage to the DCP during this period. The computational effect of this error was determined to be negligible to the quality of the record and was therefore ignored. This issue was resolved on October 22, 2009; as the SDR's programming has been altered so that the end of day computational routine does not occur. During May 5-7, 2010, the initial flush of ditch was apparently not recorded by DWR SDR. These days were estimated from NCWCD data. During May 7-12, 2010, the SDR calibration is in question. Water was first run starting on May 7, 2010, with the gage's initial SDR calibration visit made subsequently on May 12, 2010 when a -0.02 ft correction was made. Instrument calibration was supported by 134 visits made by NCWCD and DWR staff to the gage this year. NCWCD readings on the DWR instrument were not used for calibration, but the DWR and NCWCD data sets were compared directly. Primary (DWR) and back-up (NCWCD) data agreed to within +/-0.02 ft, except for the initial start up of the canal in May. Once the -0.02 ft correction on May 12 was applied, the data sets agreed. The record has high reliability except for the May 5-7 flush which was only recorded by NCWCD. This structure is not operated in winter months; typically the structure is not in use from November through May. Diversions were discontinued on October 31, 2009 and resumed again on May 7, 2010. The DCP was winterized on November 23, 2009 and reactivated on April 22, 2010.
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume crest and adjusted by NCWCD personnel accordingly. There is no indication that NCWCD personnel performed levels this year. Levels were last known to be run by both NCWCD and DWR staff in the 2005 water year and were found to be within allowable tolerances.
Rating.--	The control is a 15 foot Parshall flume. Rating No. 5, a non-standard rating, in use since October 1, 1978, was continued this year. Rating No. 5 compensates for abnormal approach conditions resulting from the steep gradient concrete canal chute above the flume resulting in high approach velocities. Rating No. 5 plots to the right of a standard Parshall rating, showing more water than the standard rating. However, due to the aging condition of the canal, increased approach velocities seem to be somewhat offset by friction losses upstream of the flume. Get-away conditions are good; submergence and backwater are not a problem. Two discharge measurements (Nos. 172 and 173) were made during the year ranging in discharge from 105 to 274 cfs. Discharge measurements and two observations of zero flow cover a majority of the range in discharge experienced this year. The peak flow of 404 cfs occurred at 1245 September 4, 2010 at a gage height of 3.24 feet with a shift of 0.00 ft. It exceeded Msmt. No. 173 made August 17, 2010 by 0.69 feet of stage and 130 cfs.
Discharge.--	Discharge measurements within 5% of the rating are adjusted to the rating (zero shift) as per agreement with NCWCD and the Water Commissioner. Both WY2010 measurements showed unadjusted shifts of 0.00 feet. Msmt. Nos. 171 to 174 made preceding and following WY2010 required adjustments of 2% and -2%, respectively. Discharge was computed by applying the rating directly to gage height record.

Special Computations.-- Discharge for periods (October 31-November 2, 2009) when stage was found to be sustained at 0.08 feet and below was adjusted to zero.

Remarks.-- The record is good, except for May 5 through 7 which is considered fair. Station maintained and record developed by Russell V. Stroud.

Recommendations.-- Levels should be run in the 2011 water year to verify ETG calibration and flume levelness.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO

RATING TABLE--

SVSLYOCO05 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	0	0	0	0	0	0	0	2	17	225	395
2	50	0	0	0	0	0	0	0	9.5	12	207	393
3	49	0	0	0	0	0	0	0	9.3	20	210	393
4	49	0	0	0	0	0	0	0	9.8	28	196	398
5	45	0	0	0	0	0	0	21	14	28	178	395
6	60	0	0	0	0	0	0	99	20	27	160	361
7	79	0	0	0	0	0	0	28	20	27	170	329
8	76	0	0	0	0	0	0	4.4	19	24	210	328
9	76	0	0	0	0	0	0	4.2	19	47	217	316
10	77	0	0	0	0	0	0	4.8	19	62	227	288
11	70	0	0	0	0	0	0	5.7	16	63	238	277
12	60	0	0	0	0	0	0	5.8	12	66	247	273
13	91	0	0	0	0	0	0	6.2	12	67	253	274
14	139	0	0	0	0	0	0	6	11	68	251	264
15	215	0	0	0	0	0	0	5.9	9.5	70	257	255
16	253	0	0	0	0	0	0	5.4	8.2	78	266	239
17	252	0	0	0	0	0	0	5.7	7.3	93	272	215
18	253	0	0	0	0	0	0	6.1	8.9	105	268	205
19	225	0	0	0	0	0	0	5.8	13	104	274	195
20	193	0	0	0	0	0	0	4.6	15	114	292	185
21	198	0	0	0	0	0	0	1.9	17	125	294	172
22	206	0	0	0	0	0	0	2.1	15	125	291	160
23	205	0	0	0	0	0	0	1.9	15	124	299	130
24	200	0	0	0	0	0	0	1.4	15	149	321	110
25	199	0	0	0	0	0	0	1.5	15	156	325	93
26	196	0	0	0	0	0	0	2.1	18	165	325	75
27	140	0	0	0	0	0	0	1.9	15	185	339	75
28	86	0	0	0	0	0	0	1.8	16	191	350	75
29	70	0	0	0	---	0	0	1.6	15	196	353	89
30	56	0	0	0	---	0	0	7.9	15	209	378	110
31	32	---	0	0	---	0	---	6.4	---	228	398	---
TOTAL	3960	0.00	0.00	0.00	0.00	0.00	0.00	249.10	410.5	2973	8291	7067
MEAN	128	0	0	0	0	0	0	8.04	13.7	95.9	267	236
AC-FT	7850	0	0	0	0	0	0	494	814	5900	16450	14020
MAX	253	0	0	0	0	0	0	99	20	228	398	398
MIN	32	0	0	0	0	0	0	0	2	12	160	75

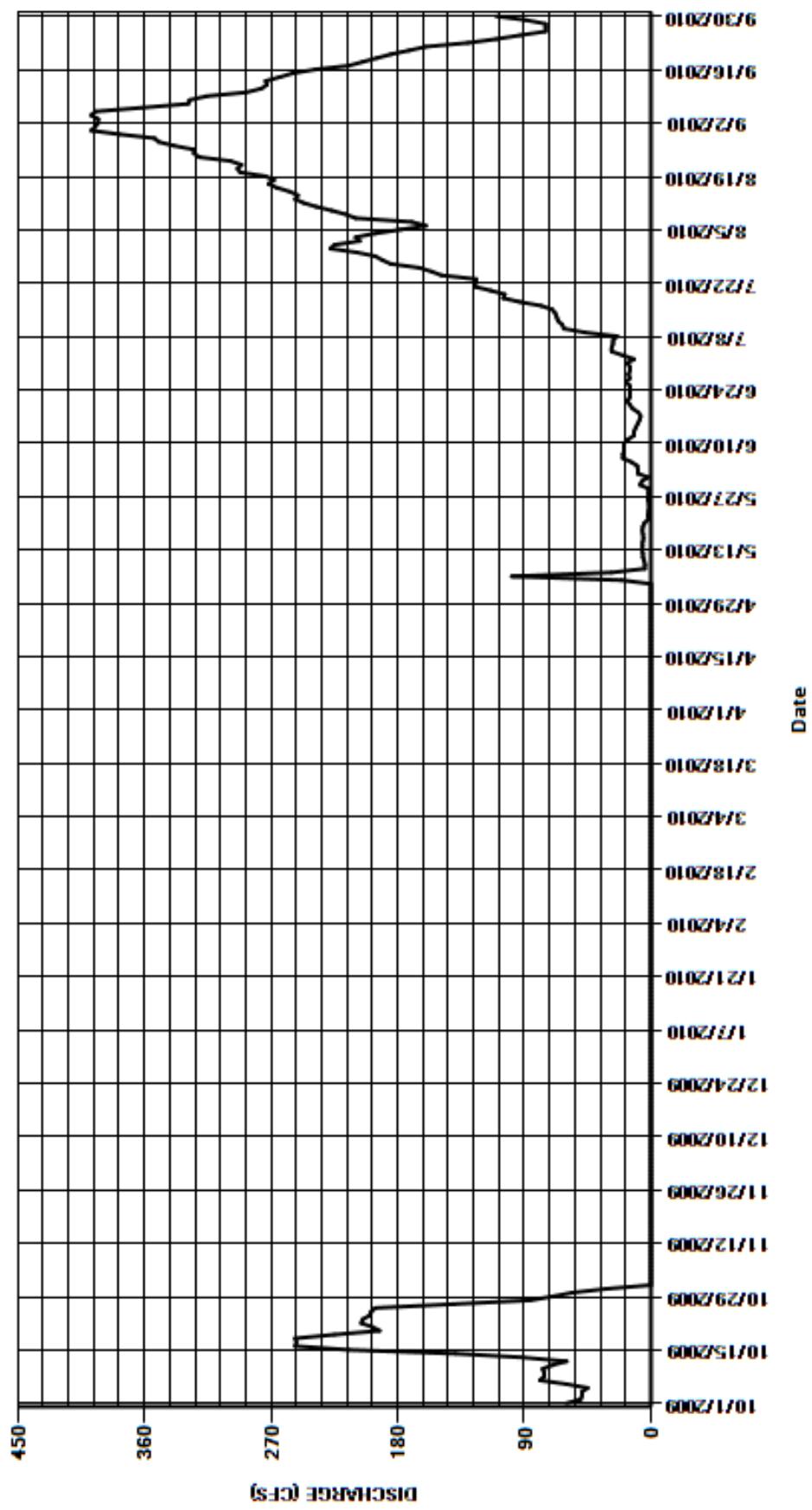
CAL YR	2009	TOTAL	19761.00	MEAN	54.1	MAX	301	MIN	0	AC-FT	39200
WTR YR	2010	TOTAL	22950.60	MEAN	62.9	MAX	398	MIN	0	AC-FT	45520

MAX DISCH: 404 CFS AT 12:45 ON Sep. 04,2010 GH 3.24 FT. SHIFT 0 FT.

MAX GH: 3.24 FT. AT 12:45 ON Sep. 04,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
Water Year 2010

Location.--	Lat. 40°15'29", Long. 105°12'21", SW¼NW¼ sec. 2, T. 3 N., 70 W., Boulder County, on the left bank, at the mouth of the Canyon, 1800 ft. upstream from the Culver Ditch Diversion and 8.5 mi. southwest of Berthoud, Co.
Drainage and Period of Record.--	100 mi ² . 1962-1969, 1993 to present.
Equipment.--	Graphic water stage recorder and shaft encoder connected to a Sutron High Data Rate (HDR) Data Collection Platform (DCP) in a 42-inch metal shelter and well. An Electric Drop Tape is the primary reference gage.
Hydrologic Conditions.--	Drainage area consists of scrub oak and grass lands. Natural flows are augmented by seepage from the St. Vrain Supply Canal--Colorado-Big Thompson project. The SVSC Little Thompson turnouts are located about 0.25 miles upstream of the gage, but flow enters just below the gage. At higher flow the CBT deliveries appear to cause backwater at gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart as back up. The record is complete and reliable for the period of gage operation, except for the following days: October 2-11, due to backwater from CBT releases. This was determined using preliminary shift distributions, along with a spreadsheet comparing daily GH's to release flows. During this period October 7 (1600) to October 8 (1600) showed a distinct 24 hour GH rise, directly corresponding to delivery changes downstream. Partial day record only on November 6, 2009 (Turn off) and March 4, 2010 (Turn on). The station was closed for winter from November 7, 2009 through March 03, 2010.
Datum Corrections.--	Levels were not run this water year. It appears that levels have not been run since 1983.
Rating.--	The control is a degraded rock dam. A new rating (No. 13) was created since large negative shifts (-0.70 feet and less) were experienced at the upper end of Rating 12 this water year. Rtg 13 is defined by measurements to 237 cfs. Rtg. 12 was defined to 563 cfs, however this measurement was not used for the new rating due to large vegetative growth on channel banks over the past 10-15 years. Thirteen measurements (608-620) were made during the 2010 water year, ranging in discharge from 0.25 to 237 cfs. They cover the range experienced this year well, except the lower mean daily flows of September 14-21, 24-30, and the higher mean daily flows on May 16-17. The peak flow of 270 cfs occurred at 0615 May 16, 2010 at a gage height of 5.24 ft with a shift of 0.06 ft. It exceeded measurement No. 616 made May 18, 2010 by 33 cfs and 0.23 feet of stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation and washing out of material on the rock dam control, and vegetation growing in the channel. Measurements showed unadjusted shifts ranging from -0.34 to +0.05 feet. Shifts were distributed as follows during October 1 – November 5, 2009: Large (0.20 ft) shift change, with backwater noted on November 5. Backwater was thought to arise after channel changes downstream due to CBT deliveries made during October. Also, some GH rises correlate with entry of water from CBT turnouts downstream, indicating that during deliveries shifts might be even more negative than were measured. The -0.26 ft shift from November 5 was taken back to turnout activity on October 29. The (0.20) shift change was pro-rated from October 1 to October 29. This gave flows normal for this time of year for October 12-31. But Oct 2-11 looked too high, and this was a CBT delivery period. So the October 2-11 flows were estimated. November 6 – March 3, 2010: Gage closed for winter. During the periods March 4 - April 20, and August 23 – September 30, 2010 shifts were prorated by time with some consideration of stage using measurements made during these periods. During the runoff period from April 15 through August 31, 2010, shifts were distributed by stage using two variable stage-shift relationships: LTCANYCOSC1, applied from April 20 to the peak at 0615 May 16 based on Msmts 612-616; and, LTCANYCOSC2, applied from the peak to August 23, 2010, based on Msmts 616-619. Four measurements (Nos. 614, 615, 617 and 619) were discounted up to 4% to better fit shift distributions.
Special Computations.--	The SVSC Little Thompson turnouts for October 2009 were loaded into a spreadsheet and totaled. These were compared with daily GH's for the period. GH rises correlated to turnout activity, indicating backwater effects. Discharge for October 2-11 was estimated from adjacent record. Base flow was assumed to be constant, since rain was negligible. Discharges for November 6, 2009 and March 4, 2010 were estimated from partial record.
Remarks.--	The record is considered fair, except for October 2-11, 2009 which is estimated and poor due to backwater; and November 6 and March 4, 2010 which are estimated and poor due to partial record. Almost all measurements made had a high maximum discharge per section percentage (often greater than 10%) due to rocky measurement sections. While the peaks were completely profiled, other measurements were often 5 weeks apart. This led to poor definition for stage table periods. The fair rating is due to the limits of measurement accuracy, and for lack of rating definition. This gage is a partial year station that is closed in the winter months with no winter record kept or estimated. Station maintained and record developed by Lee Cunning.
Recommendations.--	An outside staff should be installed and used. A full set of levels should be run and a levels summary sheet brought up to date. The vegetation surrounding the gage needs to be removed so that the control is visible from the gage. When backwater is noted, the downstream channel should be walked to see if the inflow area for CBT water is the source of the backwater. If so, photos should be taken for possible channel work by NCWCD. Also, it would be good to observe/measure more frequently during October.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD

RATING TABLE--

LTCANYCO13 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

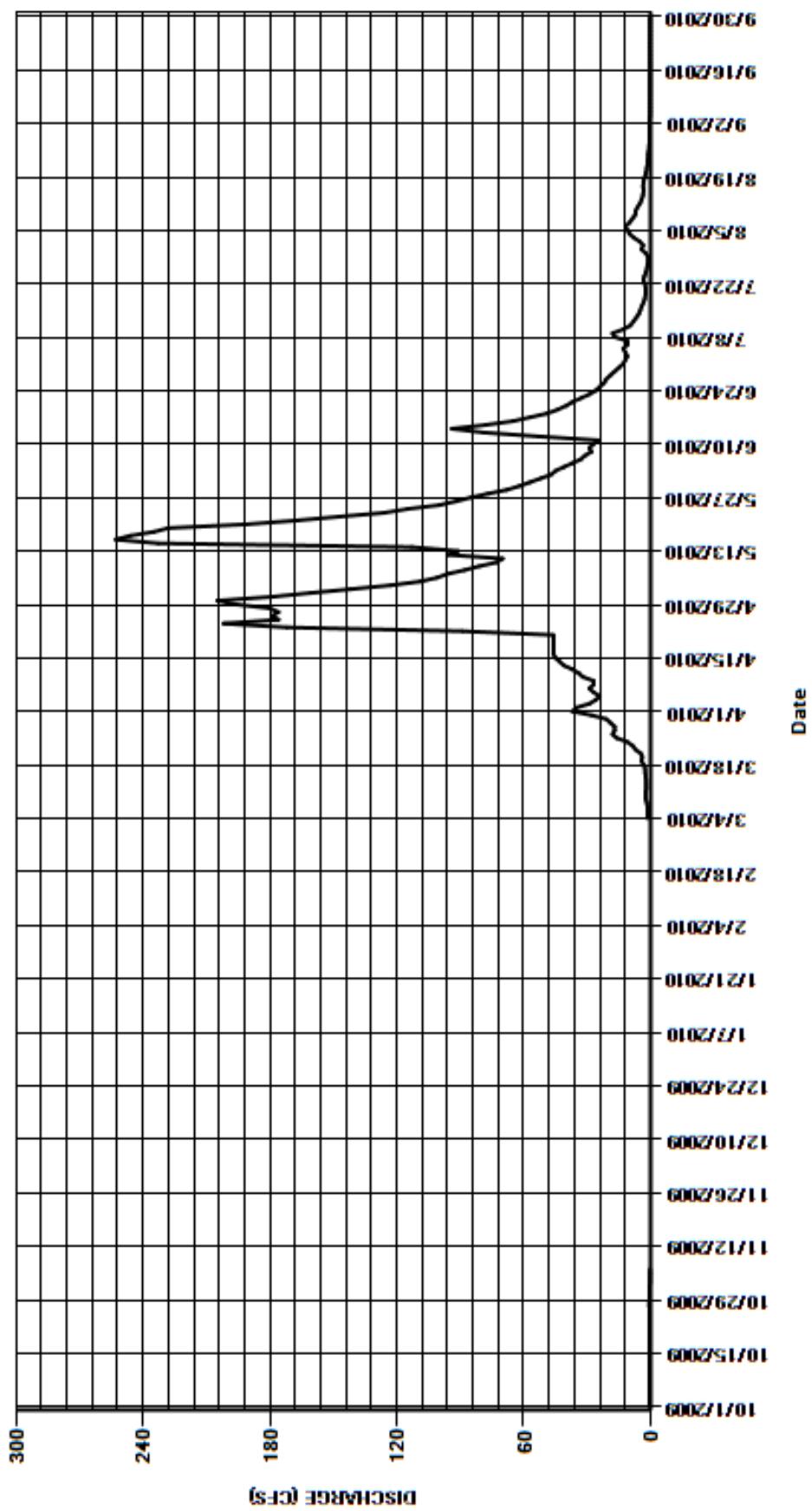
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.63	0.41	---	---	---	---	37	179	52	13	3.5	0.41
2	0.6	0.39	---	---	---	---	35	161	47	12	5.1	0.41
3	0.6	0.34	---	---	---	---	29	142	45	11	7.9	0.43
4	0.6	0.32	---	---	---	1.5	26	123	41	12	10	0.34
5	0.6	0.3	---	---	---	1.6	24	109	37	13	11	0.28
6	0.6	0.3	---	---	---	1.4	27	101	33	11	12	0.28
7	0.6	---	---	---	---	1.5	29	96	31	11	9.9	0.29
8	0.6	---	---	---	---	1.8	27	88	28	17	8.6	0.29
9	0.6	---	---	---	---	2.3	27	81	29	18	7.3	0.28
10	0.6	---	---	---	---	2.5	32	73	27	13	7.1	0.25
11	0.6	---	---	---	---	2.4	34	70	25	9.6	6.2	0.27
12	0.61	---	---	---	---	2.1	37	96	53	8.3	5	0.25
13	0.56	---	---	---	---	2.2	41	91	79	6.9	4.3	0.26
14	0.55	---	---	---	---	2.2	43	113	94	5.7	3.7	0.22
15	0.52	---	---	---	---	2.4	45	233	78	4.9	3.4	0.21
16	0.51	---	---	---	---	2.6	46	253	65	4.3	3.5	0.21
17	0.51	---	---	---	---	2.7	46	246	57	3.4	3.5	0.19
18	0.49	---	---	---	---	3.2	46	235	49	2.8	3.2	0.2
19	0.46	---	---	---	---	4.4	46	228	44	2.5	2.7	0.22
20	0.47	---	---	---	---	3.9	46	191	40	2.4	2.2	0.21
21	0.51	---	---	---	---	4.7	46	167	37	2.5	1.9	0.23
22	0.47	---	---	---	---	7.2	89	147	33	2.7	1.6	0.28
23	0.46	---	---	---	---	8.5	172	126	29	3.5	1.4	0.29
24	0.48	---	---	---	---	11	202	115	26	2.9	1.3	0.24
25	0.55	---	---	---	---	16	176	100	24	2.2	1.2	0.23
26	0.57	---	---	---	---	18	179	92	22	1.8	0.86	0.22
27	0.61	---	---	---	---	17	176	85	21	1.4	0.67	0.22
28	0.67	---	---	---	---	17	180	77	19	1.3	0.57	0.22
29	0.52	---	---	---	---	19	196	68	17	1.2	0.47	0.21
30	0.48	---	---	---	---	21	205	62	15	2.4	0.44	0.22
31	0.45	---	---	---	---	28	---	57	---	4.4	0.42	---
TOTAL	17.08	2.06	---	---	---	208.1	2344	4005	1197	208.1	130.93	7.86
MEAN	0.55	0.34	---	---	---	7.43	78.1	129	39.9	6.71	4.22	0.26
AC-FT	34	4.1	---	---	---	413	4650	7940	2370	413	260	16
MAX	0.67	0.41	---	---	---	28	205	253	94	18	12	0.43
MIN	0.45	0.3	---	---	---	1.4	24	57	15	1.2	0.42	0.19
CAL YR	2009	TOTAL	2027.27	MEAN	8.14	MAX	63	MIN	0.3	AC-FT	4020	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	8120.13	MEAN	32.7	MAX	253	MIN	0.19	AC-FT	16110	(PARTIAL YEAR RECORD)

MAX DISCH: 270 CFS AT 06:15 ON May. 16,2010 GH 5.24 FT. SHIFT 0.06 FT.

MAX GH: 5.24 FT. AT 06:15 ON May. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
Water Year 2010

Location.--	Lat. 40°21'00", Long. 104°47'04", in SW1/4, SE1/4, Sec. 33, T.5N., R.66 W., Weld County, CO, on left bank just southeast of gage on Evans Town Ditch, 0.7 miles upstream from bridge on WCR 396, 1.6 miles upstream from mouth and 4 miles West of LaSalle, CO.
Drainage and Period of Record.--	828 mi ² . 1951 to present.
Equipment.--	Graphic water stage recorder and shaft encoder connected to a Sutron SatLink 2 DCP in a wooden shelter with galvanized well section. An Electric Drop Tape (ETG) is the primary reference gage. A supplemental outside chain gage is unreliable. Control is a 50-60 foot smooth concrete control on bedrock, about 2 feet high with rounded crest, located about 20 feet below the gage.
Hydrologic Conditions.--	Drainage area consists of high mountain terrain, municipal and agricultural areas. Gage is located downstream from many agricultural diversions which attempt to divert all available water. Flow is mostly seepage, return flows from agriculture, local runoff and municipal runoff and wastewater. The Colorado-Big Thompson (CBT) project historically releases 'carry-over' water at the end of October every year to downstream users that have rights to that water.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart back up. The record is complete and reliable, except for the following days when the gage was ice affected and/or the well was frozen: December 4–5, 9–12, 24–31, 2009, January 1–13, February 10, 23–24, 2010. During October 20–21, 2009, there were no DCP data. Chart data were used with no loss of accuracy. During the periods May 26–29, 31, July 5–7 2010, the shaft encoder float and counterweight were hung up on each other. This caused the float to hang and the shaft encoder recorded a continuous gage height. Record was replaced with good chart data with no loss of accuracy. On June 23, 2010, this same issue occurred, however, the chart float was also hung up, so data were estimated using periods of good data before and after. Daily maximum and minimum stages for the satellite record agreed within +/- 0.02 feet of the chart. Two instrument corrections were made this water year as follows. July 6, 2010: Deputy Water Commissioner adjusted the shaft encoder - 0.54 feet. This was an incorrect adjustment as this was a period where the float and weight were hung up. Float should have been checked at this time, but was not. July 7, 2010: Float was put back in the water and a +0.54 foot correction was made to fix the erroneous correction made the day before. Chart data were used for July 6–7, 2010 with no loss of accuracy. A new shaft encoder and float were installed to hopefully alleviate this issue from happening again.
Datum Corrections.--	Levels were run September 14, 2010. Gage was found to read 0.002 feet low which is within the allowable limits of +/- 0.02 ft. However, the measured tape length was found to be +0.03 feet long, therefore the tape length was adjusted from 11.844 feet to 11.818 feet on September 15, 2010. All measurement gage heights were adjusted by -0.03 ft and a -0.03 ft datum correction was applied to the gage height record from October 1, 2009 to September 14, 2010.
Rating.--	The control is a 50-60 foot smooth concrete control on bedrock, about 2 feet high with rounded crest, located about 20 feet below the gage. At around 1000 cfs, the control submerges due to downstream channel conditions. Flood flows will go overbank on the right side. Rating No. 25, in use since April 29, 1999, was used for real time data during the water year. However, higher than normal flows were measured with shifts in the range of -1.00 feet. Rating 26 was developed during the year, but was found to be in error and not used for any purpose. New Rating 27 was created for the 2010 record and is defined by measurements from 1.14 to 6000 cfs. Rating 27 was created using Rating 25 up to 220 cfs (Measurement 567) and then measurements 568, 570 and 571. Historic high flow measurements (293, 373 and 959) which were used in creating Rating 25 were used for the high end of Rating 27. Seventeen measurements (Nos. 560-576) were made during the 2010 water year and were all used in the rating. They ranged in discharge from 26.4 to 1380 cfs. No days were seen with flows below 1.14 cfs, the measured range for the critical head control portion of the rating. However, the control was submerged at 1380 cfs, and one day (June 14, 2010) was observed above 1380 cfs. The peak flow of 1640 cfs occurred at 1600 June 13, 2010 at a gage height of 6.34 ft (datum correction of -0.03 ft applied) with a shift of 0.00 ft.
Discharge.--	Shifting control method was used all year. Shifts are caused by material scouring and filling the pool behind the control. Shifts were applied as defined by measurements and were distributed by time with some considerations to stage. Measurements show shifts varying between -0.02 and +0.02 ft. Since a new rating was created, measurements were discounted up to 6% to zero out all measurement shifts this water year. Discharge was computed by direct application of Rtg 27 to the corrected gage height record.
Special Computations.--	Discharge for ice affected periods was estimated by interpolation between periods of good record and temperature trends. Discharge for June 23, 2010, when both chart and encoder had float problems was estimated from adjacent good record.
Remarks.--	The record is good, except for periods of ice effect and no gage height record, which are estimated and fair to poor. Station maintained and record developed by Lee Cunning.
Recommendations.--	Continue efforts to get higher flow discharge measurements and define the point at which the control goes into submergence.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE

RATING TABLE--

BIGLASCO25 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	57	82	66	55	73	84	43	211	110	56	89	49
2	45	86	68	55	72	85	41	195	85	51	92	38
3	40	91	66	60	72	87	40	176	53	85	87	35
4	39	86	65	60	74	88	40	159	34	91	109	33
5	40	78	65	55	75	90	40	133	57	278	105	31
6	40	76	66	60	74	88	43	110	203	166	94	29
7	44	73	65	55	74	88	48	99	296	142	112	29
8	38	71	65	55	74	93	49	94	838	104	102	31
9	37	70	60	55	72	94	47	90	850	108	87	30
10	42	67	60	60	70	94	45	166	572	137	74	27
11	45	68	55	60	72	93	44	159	510	115	78	25
12	55	68	55	60	78	90	42	283	606	126	78	24
13	70	69	57	65	76	90	37	284	1280	99	89	25
14	65	69	58	68	76	90	33	255	1440	99	83	30
15	62	74	56	67	74	89	30	324	1040	132	79	25
16	60	77	56	67	71	89	28	534	746	116	71	22
17	57	71	55	68	69	87	29	492	611	98	80	26
18	56	71	56	69	76	86	32	432	655	91	73	33
19	56	70	56	68	77	86	31	508	634	82	68	33
20	56	70	56	67	75	90	27	467	576	80	68	51
21	54	70	54	65	75	85	24	365	507	76	52	40
22	54	71	55	66	75	65	87	331	371	78	57	35
23	51	70	58	66	75	58	130	341	250	120	55	34
24	52	66	55	65	75	77	163	465	160	70	48	32
25	53	66	55	63	77	84	91	392	130	67	40	29
26	54	67	55	61	79	59	66	222	96	58	32	28
27	56	67	55	62	85	54	57	185	78	49	33	28
28	77	66	55	70	86	51	107	156	85	59	38	28
29	83	65	55	73	---	48	197	219	114	71	45	28
30	75	65	55	72	---	46	223	226	93	87	53	27
31	79	---	55	73	---	44	---	132	---	80	44	---
TOTAL	1692	2160	1813	1965	2101	2452	1914	8205	13080	3071	2215	935
MEAN	54.6	72	58.5	63.4	75	79.1	63.8	265	436	99.1	71.5	31.2
AC-FT	3360	4280	3600	3900	4170	4860	3800	16270	25940	6090	4390	1850
MAX	83	91	68	73	86	94	223	534	1440	278	112	51
MIN	37	65	54	55	69	44	24	90	34	49	32	22

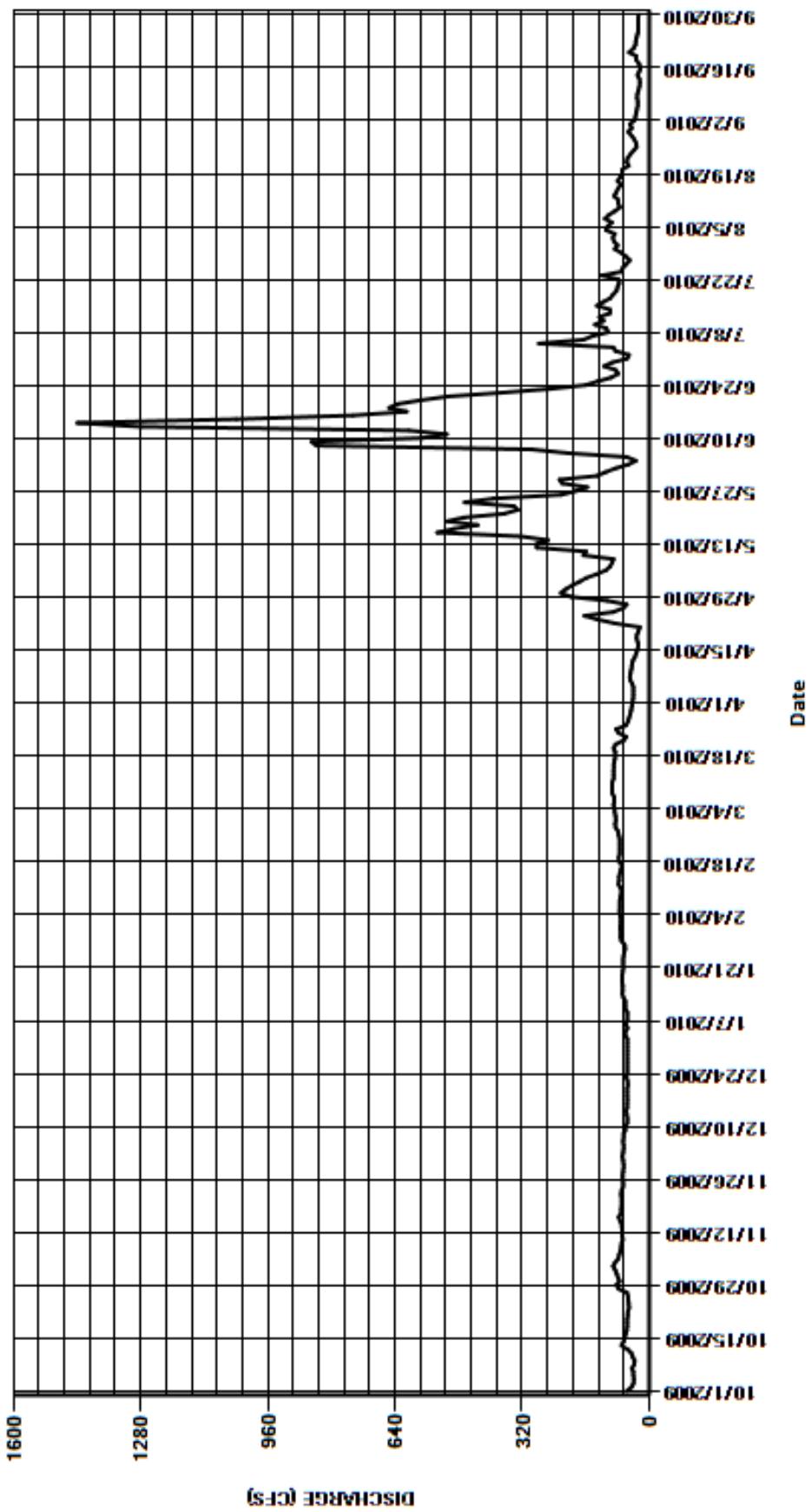
CAL YR	2009	TOTAL	16378.06	MEAN	44.9	MAX	259	MIN	0.86	AC-FT	32490
WTR YR	2010	TOTAL	41603	MEAN	114	MAX	1440	MIN	22	AC-FT	82520

MAX DISCH: 1640 CFS AT 16:00 ON Jun. 13,2010 GH 6.34 FT. SHIFT 0 FT. (-0.03 FT DATUM CORR. APPLIED)

MAX GH: 6.34 FT. AT 16:00 ON Jun. 13,2010 (-0.03 FT DATUM CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS

Water Year 2010

Location.--	Lat. 40°39'52", Long. 105°13'26", in NW 1/4 sec. 15, T.8 N., R.70 W., Larimer County, Hydrologic Unit 10190007, on left bank at mouth of canyon, 0.5 mi downstream from headgate of Poudre Valley Canal, 1.2 mi upstream from Lewistone Creek, and 9.3 mi northwest of courthouse in Fort Collins.
Drainage and Period of Record.--	1,056 mi ² . Sporadic and somewhat unreliable data from June 1881 to Aug. 1883. Reliable data from Oct. 1883 to current year. Periodic water-quality data from 1962 to 1995.
Equipment.--	Graphic (weekly) water stage recorder and shaft encoder connected to a Sutron SatLink 1 DCP in a concrete shelter and stilling well. The primary reference gage is an Electric Tape Gage (ETG). There is a supplemental outside chain gage.
Hydrologic Conditions.--	Drainage area consisting of high mountain forested and mostly uninhabited terrain. Flow is partially controlled by releases from Seaman Reservoir. Several small transmountain diversions divert water from the Colorado and North Platte River Basins into the basin. Runoff in the Cache la Poudre basin was above normal this year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from satellite monitoring with chart as back up. The record is complete and reliable, except for the following periods. The stage discharge relationship was affected by ice on November 15-24, 2009 and March 3-4, 2010. November 25, 2009 the station was closed for the winter and reopened on March 3, 2010, only partial record available. The gage was visited, and chart and encoder calibration was checked, at least weekly; no corrections were indicated or made. Encoder mean gage heights checked with chart values to within +/- 0.02 ft. Missing satellite data were filled in with chart data with no loss of accuracy.
Datum Corrections.--	Levels were last run August 27, 2009 and the gage was found to read correctly.
Rating.--	Control is a rock and gravel riffle about 100 feet downstream. This riffle was increased this year due to sustained flows in excess of 4,000 cfs. Fill and scour will still cause minor shifting. Rating CLAFTCCO12 was used from October 1, 2009 to the local peak at 1000 June 2, 2010. A new rating (CLAFTCCO15) was developed and used from 1100 June 2, 2010 through the end of Water Year 2010. Ratings 13 and 14 were used for real time data in 2010 and archived, but were not used for the record. Rtg. 15 was developed using higher than usual flow measurements and new low flow measurements (491-502) to better define the new low end. Twenty measurements (Nos. 483-502) were made this year, ranging in discharge from 14.1 to 4,340 cfs. These cover the range in daily discharge experienced without exception. Measurements were made on or near the peak and low flow days. The peak flow of 4,770 cfs occurred at 1200 June 12, 2010 at a gage height of 6.94 feet with a shift of 0.00 ft. It exceeded the gage height of measurement No. 493, made on June 8, 2010 by 0.25 feet.
Discharge.--	Shifting control method was used all year. Shifts are caused by moss growth and by material moving in and out of the control section. Rating CLAFTCCO12 was used from October 1, 2009 to 1000 June 2, 2010. Open water measurements 483-490 showed unadjusted shifts varying from -0.02 to +0.01 ft using this rating. Shifts were distributed by time proration. Measurements were given full weight except Msmts 488 and 490 were discounted up to 2% to smooth shift distributions. Rating CLAFTCCO15 was used from 1100 June 2, 2010 through the end of the water year. Open water measurements 490-502 showed unadjusted shifts varying from -0.02 to +0.02 ft using this rating. Measurements were given full weight except Msmts 490, 496, 497 and 498 were discounted up to 5% to zero shift. Discharge was computed by direct application of Rtg 15 to the gage height record during this period. Transition between Ratings 12 and 15 occurred on the June 2 measurement (No.490). The two ratings were nearly identical for the flow measured. Msmt 490 was discounted 1% to a zero shift for both ratings.
Special Computations.--	Discharges from November 15, 2009 through January 5, 2010 were estimated and are based on the flows from a downstream gage-- USGS 06752260 CACHE LA POUDRE RIVER AT FORT COLLINS. No diversions were active in the reach between the two gages during this period. From January 6 to March 3, 2010 diversions were active between the canyon gage and the USGS gage. The Water Commissioner estimated daily flow at the canyon gage, and his figures were used. March 3-5 were estimated from partial ice affected record.
Remarks.--	The record is good, except for the periods of ice affected and no gage height record, which are estimated and poor. Station maintained and record developed by Lee Cunning.
Recommendations.--	Run levels in Water Year 2011 .

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS

RATING TABLE--

CLAFTCCO12 USED FROM 01-Oct-2009 TO 02-Jun-2010
CLAFTCCO15 USED FROM 02-Jun-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

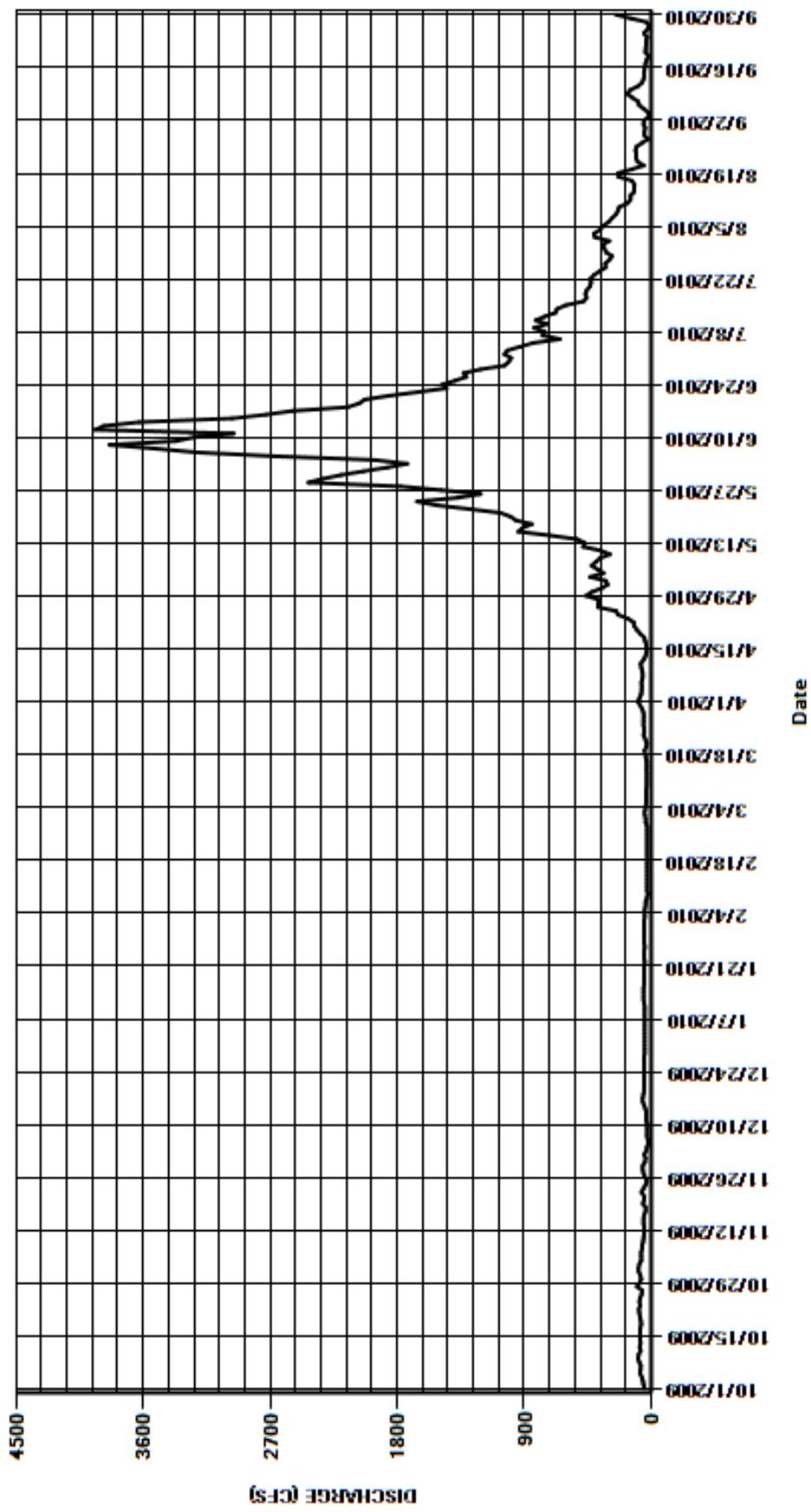
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	89	40	45	50	40	95	352	2040	993	298	55
2	54	89	50	45	50	45	82	308	1870	1040	400	51
3	59	84	35	45	45	45	71	323	1730	1020	405	15
4	67	70	30	45	45	40	69	434	1960	930	361	20
5	79	72	20	45	45	37	67	338	2670	836	342	53
6	76	72	25	45	40	36	70	380	3220	648	302	86
7	73	66	30	45	40	36	63	423	3510	770	280	94
8	85	64	30	45	30	36	61	392	3840	756	252	136
9	93	57	30	45	25	34	63	363	3370	830	236	169
10	89	54	30	45	30	32	71	292	3240	737	227	150
11	75	50	35	50	30	31	75	360	2960	819	169	93
12	82	51	35	55	30	31	56	482	3940	754	147	64
13	76	51	35	55	30	31	41	471	3880	679	148	53
14	78	55	40	55	30	34	34	525	3630	667	123	49
15	81	55	50	55	30	32	33	720	2970	605	121	49
16	77	50	60	50	30	32	35	942	2730	480	119	45
17	77	40	60	50	30	38	43	912	2540	458	139	41
18	72	40	55	50	30	42	50	846	2150	467	232	32
19	74	60	50	50	30	47	79	959	2070	456	234	20
20	80	50	50	50	30	35	102	997	2030	435	138	42
21	84	50	50	50	30	32	120	1070	1860	427	53	39
22	88	70	50	45	30	42	125	1290	1650	431	97	37
23	78	55	50	50	30	53	167	1520	1450	405	109	37
24	84	40	50	50	30	51	235	1660	1480	365	106	29
25	79	30	50	50	30	51	250	1370	1390	324	111	52
26	68	45	50	45	30	56	377	1210	1310	326	104	28
27	65	55	50	50	30	55	376	1490	1330	297	65	13
28	101	60	50	50	40	52	372	1780	1210	278	21	34
29	81	60	45	50	---	55	462	2430	1040	320	49	145
30	72	45	45	50	---	64	422	2330	1010	331	48	253
31	77	---	45	50	---	79	---	2200	---	348	43	---
TOTAL	2372	1729	1325	1510	950	1324	4166	29169	70080	18232	5479	1984
MEAN	76.5	57.6	42.7	48.7	33.9	42.7	139	941	2336	588	177	66.1
AC-FT	4700	3430	2630	3000	1880	2630	8260	57860	139000	36160	10870	3940
MAX	101	89	60	55	50	79	462	2430	3940	1040	405	253
MIN	48	30	20	45	25	31	33	292	1010	278	21	13
CAL YR	2009	TOTAL	98961	MEAN	271	MAX	1740	MIN	10	AC-FT	196300	
WTR YR	2010	TOTAL	138320	MEAN	379	MAX	3940	MIN	13	AC-FT	274400	

MAX DISCH: 4770 CFS AT 12:00 ON Jun. 12,2010 GH 6.94 FT. SHIFT 0 FT.

MAX GH: 6.94 FT. AT 12:00 ON Jun. 12,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06752500 CACHE LA POUDRE NEAR GREELEY
Water Year 2010

Location.--	Lat. 40°25'04", Long. 104°39'22", in NW 1/4 sec. 11, T.5 N., R.65 W., Weld County, Hydrologic Unit 10190007, on right bank 15 ft. downstream from highway bridge, 2.9 mi east of courthouse in Greeley, and 3.0 mi upstream from mouth.
Drainage and Period of Record.--	1,877 mi ² . 1903 to current year.
Equipment.--	Graphic water stage recorder, satellite monitored data collection platform (Sutron Model 8210 DCP with High Data Rate GOES radio) and shaft encoder in a 48-inch metal pipe (CMP) shelter and well. Primary reference is an electric drop tape inside well. The outside gage is a wire weight on the bridge approximately 30 feet upstream of the station.
Hydrologic Conditions.--	The snow pack in the Cache la Poudre basin produced a runoff that was above normal at the Mouth of the Canyon gage. Gage is located downstream of the City of Greeley Wastewater Treatment Facility and can show small diurnals from this effluent. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the City of Greeley. CBT deliveries of several hundred cfs for a few days duration also pass the gage. This gage received much higher than normal sustained flows this year due to quicker than normal runoff and a rare 'free-river' condition on the Cache La Poudre River which lasted into late June.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable. Checks between the primary and backup records agreed within ± 0.02 feet. Instrument calibration is supported by 28 visits made to the gage this water year. None of the visits showed the encoder differing from the tape by more than 0.005 ft.
Datum Corrections.--	Levels were run on September 16, 2010. New Reference Mark (R.M.) number 4 was established last water year and verified as accurate (Elev = 9.040 ft). Measured tape length was found to be +0.03 ft off from established references. No change was made this water year as shifts and major changes to existing channel were made and a new rating will need to be created as higher flows are available for measurement points.
Rating.--	The control is a gravel channel and a downstream riffle. The gage is located just below a county road bridge. Large gravel bars form behind the bridge and directly in front of the gage, dividing the flow into two channels at times. The channel by the gage is the main channel at flows up to about 300 cfs. Above this, flows go into the heavy deposition and vegetation across the entire width of the channel. Rating No. 27, dated January 4, 2010, was developed and used for water year 2009 and used again this water year. Rating 27 is well defined by measurements from 50 to 4,500 cubic feet per second. Seventeen measurements (Nos. 1043-1059) were made this year ranging in discharge from 65.0 to 3120 cfs. They cover the range in stage experienced except the lower daily flows of July 17-20, 25-30, August 6-8, 12-31, September 1-18, 26-28, 2010. Sometime after April 22, high flows began changing the channel and causing light flooding upstream. The May 19 measurement (No. 1048) of 913 cfs first documented this, and effectively defined flows down to about 600 cfs during the period April 22-May 19. Later measurements defined stage-shift relationships showing a dramatic deviation from Rating 27. However, flows below 600 cfs during April 22-May 19 are not well defined. A new rating will need to be developed, but the high water measurements made in 2010 will not be useful. In August , 2010, Weld County cleaned upstream, downstream and under the bridge completely. The rating above a gage height of about 2.45 ft should be much different than orginal or stage-shifted rating 27. The peak discharge of 3120 cfs occurred at 1100 June 14, 2010 at a gage height of 9.16 feet with a shift of -0.89 ft. Measurement 1052 was made at same date/time and gage height.
Discharge.--	Shifting control method was used for all periods of good record. Shifts are caused by scour and fill, vegetation and moss growth, and downstream channel constrictions. Shifts were applied as defined by measurements and were distributed by time with consideration to stage during the period October 1, 2009 – April 22, 2010. Open water measurements showed shifts varying between +0.01 and +0.09 feet. Open water measurements were given full weight except for measurements 1044-1046 which were discounted up to 3% to smooth distribution. Shifts were distributed by stage the remainder of the water year. Variable stage shift relationship CLAGRECOVSH01 was applied April 22, 2010 to the peakat 1100 June 14, 2010. This table is based on measurements 1047–1052 made during the period without adjustments. Variable stage shift relationship CLAGRECOVSH02 was applied 1200 June 14, 2010 through September 30, 2010. This table is based on measurements 1052–1061 made during the period. Low flow measurements 1056-1059 were discounted up to 3% to use the same (-0.17 ft.) shift.
Special Computations.--	None.
Remarks.--	The record is considered good, except for April 22 to May 15 which is considered fair due to lack of confirming measurements. Station maintained and record developed by Lee Cunning.
Recommendations.--	A new rating will need to be developed due to major channel renovations made after high flows this season.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06752500 CACHE LA POUDRE NEAR GREELEY

RATING TABLE--

CLAGRECO27 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

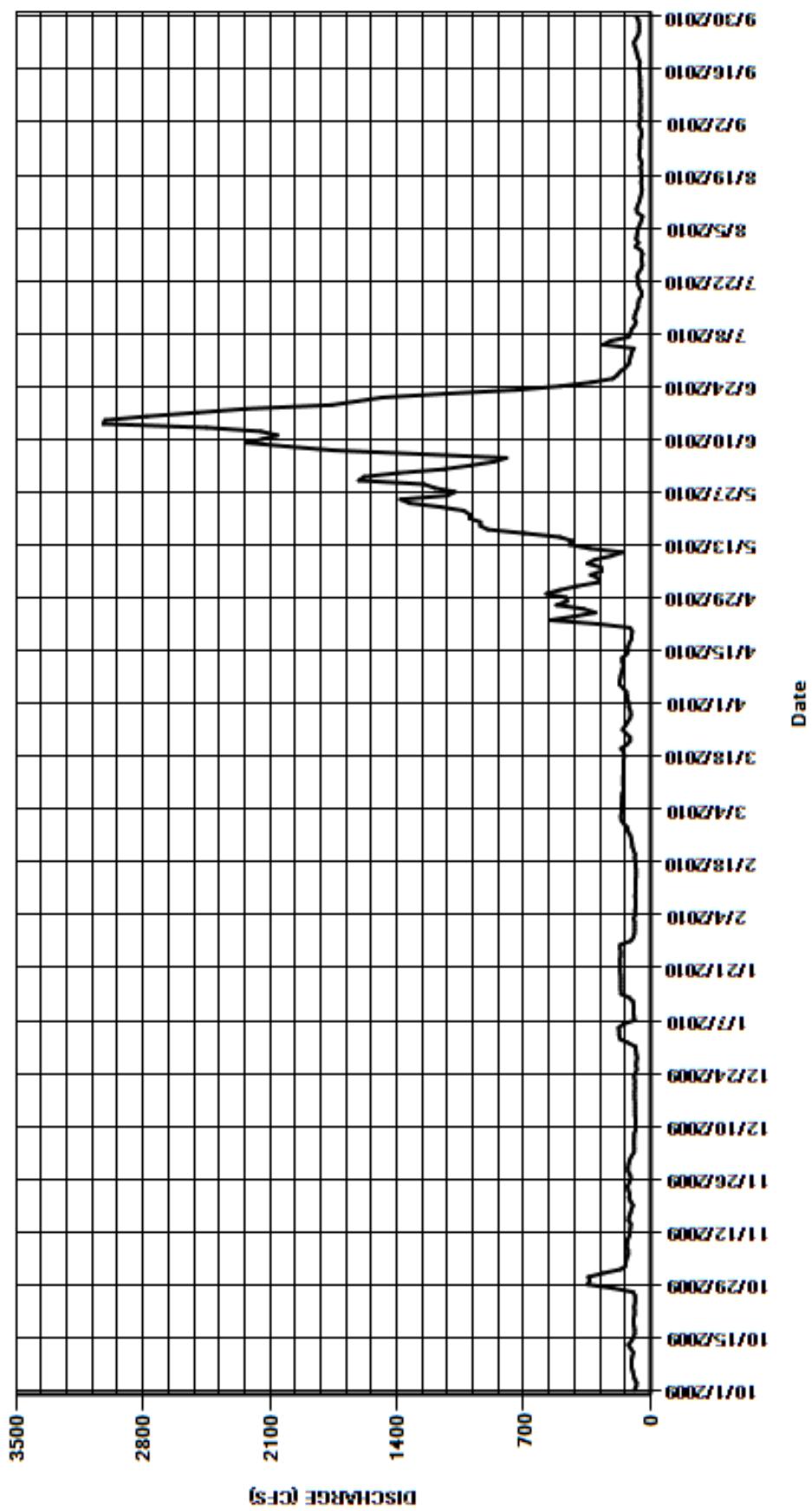
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	91	262	116	123	88	162	120	501	1390	116	67	64
2	80	166	106	168	88	165	128	408	1140	110	80	62
3	78	137	92	174	94	161	130	292	991	104	75	55
4	89	137	90	174	84	160	134	282	863	92	73	59
5	94	132	92	177	86	161	152	331	796	261	67	55
6	99	124	93	150	84	158	172	270	1270	220	58	55
7	105	124	90	89	82	159	170	274	1750	122	51	57
8	106	132	90	92	84	156	166	350	2000	112	45	57
9	105	130	83	96	86	150	162	309	2230	106	75	54
10	101	126	85	94	83	151	155	217	2140	90	78	55
11	95	116	83	95	85	151	150	156	2060	81	70	57
12	110	114	84	97	83	151	157	336	2150	91	62	59
13	123	112	86	118	83	151	157	448	2450	86	57	57
14	107	109	87	164	81	149	132	433	3020	79	51	59
15	95	122	86	165	81	149	123	500	3010	68	48	62
16	88	119	86	165	81	149	125	695	2780	68	50	65
17	88	111	88	165	83	149	117	897	2500	64	53	61
18	92	106	89	165	84	145	106	940	2230	49	50	59
19	94	97	89	167	88	149	105	939	1760	50	53	70
20	94	111	87	168	86	164	101	1000	1620	62	53	75
21	89	119	88	168	94	133	114	1000	1480	69	56	80
22	89	115	87	168	101	113	291	1030	1130	67	48	87
23	91	123	91	170	103	113	554	1160	737	75	56	93
24	87	127	85	166	107	136	422	1330	497	68	63	81
25	85	118	76	165	112	155	305	1380	325	54	62	69
26	86	109	81	169	125	141	370	1120	208	46	59	64
27	97	113	79	168	128	127	519	1080	183	49	59	64
28	205	124	75	111	147	114	460	1190	165	51	60	64
29	347	125	79	95	---	109	467	1250	137	45	53	68
30	337	121	82	90	---	112	575	1610	120	54	49	80
31	343	---	82	88	---	121	---	1580	---	84	54	---
TOTAL	3790	3781	2707	4364	2611	4464	6839	23308	43132	2693	1835	1947
MEAN	122	126	87.3	141	93.2	144	228	752	1438	86.9	59.2	64.9
AC-FT	7520	7500	5370	8660	5180	8850	13570	46230	85550	5340	3640	3860
MAX	347	262	116	177	147	165	575	1610	3020	261	80	93
MIN	78	97	75	88	81	109	101	156	120	45	45	54
CAL YR	2009	TOTAL	54000	MEAN	148	MAX	1250	MIN	32	AC-FT	107100	
WTR YR	2010	TOTAL	101471	MEAN	278	MAX	3020	MIN	45	AC-FT	201300	

MAX DISCH: 3120 CFS AT 11:00 ON Jun. 14,2010 GH 9.16 FT. SHIFT -0.89 FT.

MAX GH: 9.16 FT. AT 11:00 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752500 CACHE LAPOUDRE NEAR GREELEY
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT
Water Year 2010

Location.--	Lat 40°25'21", Long 104°40'37" in SW ¼ section 4, T5N, R65W, Weld County. Just east of Greeley, on right bank, approximately 400 feet east of Highway 85, river mile 5.5.
Drainage and Period of Record.--	Approximately 1800 sq mi. 2007 to current year.
Equipment.--	Sutron SatLink2 DCP and shaft encoder in a 7 ft by 7 ft rock façade shelter with a 48-inch diameter concrete stilling well. The primary reference gage is an electric tape gage located in the shelter. No outside reference at this time. The control is a hinged-crest gate with concrete abutments. A Tacoma style bank operated cableway is located approximately 200 feet downstream from the gaging station, for use during high flows. This gage is maintained by the City of Greeley in cooperation with the Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	Drainage area with varied topography: from mountainous terrain rising to 13,600 feet above mean sea level to rolling foothills to high plains rising to about 4600 feet. The snow pack in the Cache la Poudre basin produced a runoff discharge this year that was approximately 2.5 times greater than that produced last year. This gage cross-section is typically subject to heavy Sago pond weed growth during late spring and summer. Because of high runoff through June 2010, there was little to no pond weed this water year. While there was a slight re-occurrence of the pond weed in the later part of the water year, it was easily removed and adverse effects of the pond weed minimized.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute data with DCP log as backup. The record is complete and reliable. The hinged-crest diversion gate on the control structure, located approximately 50 feet downstream of the gaging station, has remained in a completely lowered position since 14 March 2007. It has had no effect on the reported stage record. Correlation between the shaft encoder and the tape was checked 19 times through WY2010. On July 14 a correction was made in error when a difference was noted between the encoder and the tape. This error was corrected on July 15. In all other instances noted differences were less than 0.02 ft, so no adjustments were made.
Datum Corrections.--	None.
Rating.--	The control during low to moderate flows is a 60 ft x 7 ft hinged-crest gate with concrete abutments, located approximately 50 feet downstream from the gaging station. During high flow conditions, the control is the channel. Large shifts at this gage are typically caused by thick vegetative growth along the left side of the channel, scour and fill of silt and mud, and movement of water around a sand bar that occasionally forms during low flow, just downstream of the control section. However, the measured high flow in this water year exceeded last year's measured high flow by a factor of 2.5. This resulted in the removal of the upstream sand bar, except for one submerged tree trunk, and significant scouring of the left side of the channel. As flows decreased the left side has filled in with silt. Discharge through this section exceeded Rating CLAWASCO06 from May 30-June 20, 2010. The highest discharge value on Rtg 6 is 1550 cfs at a gage height of 5.31 feet. During this period of time discharge reached a maximum of 3380 cfs at 7.88 feet. Rating CLAWASCO07 was developed and put into use on June 13, 2010 to accommodate higher flows. Thirteen discharge measurements (Nos. 60-72) were performed this year ranging in discharge from 56 to 3427 cfs. The peak flow of 3510 cfs occurred at 1830 June 14, 2010 at a gage-height of 7.88 feet with a shift of -0.13 feet.
Discharge.--	Shifting control method used. Measurements showed unadjusted shifts ranged from -0.38 to 0.28 ft. Shifts were distributed by time proration from Oct 1 2009 to April 21, 2010 and from the peak on June 14 to the end of the water year. Shifts were distributed by stage using variable stage shift relationship, CLAWASCOVSH01, from April 21 (beginning of runoff) to the peak at 1830 June 14, 2010. This table is defined by five measurements (Nos. 63-67). Rating 7 will become more representative of this section as more measurements are made.
Special Computations.--	
Remarks.--	The record is considered good. Station maintained and record developed by Greg Harp, City of Greeley Water Pollution Control Facility; record reviewed by Div I hydrographic staff.
Recommendations.--	Measurements were not taken during October, December, and January. Measurements should be taken at the minimum of once per month, with additional measurements taken when conditions warrant them. In addition, measurements at the beginning and the end of the water year should be taken close to their respective date in order to better distribute the shifts over time.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT

RATING TABLE--

CLAWASCO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

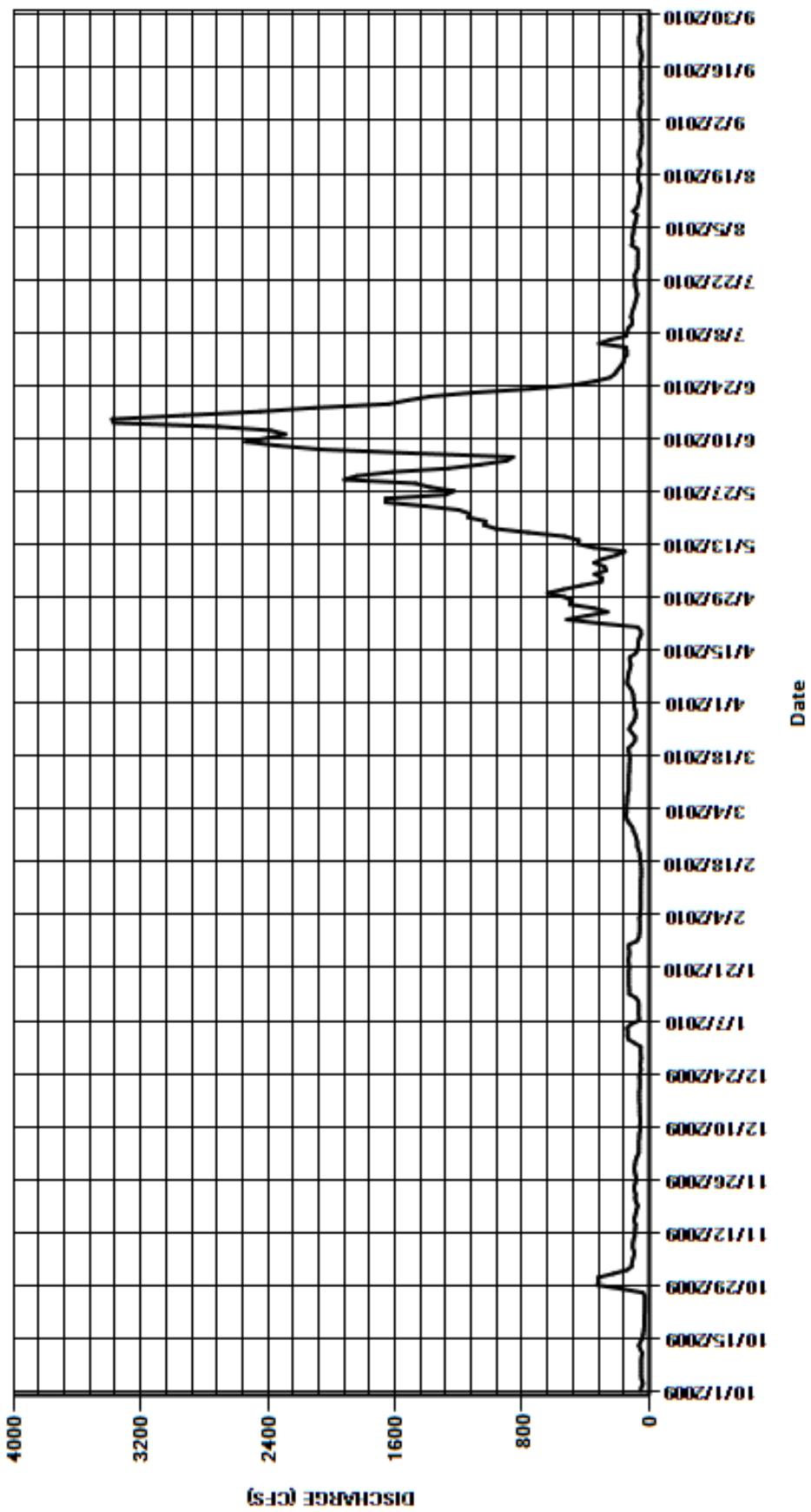
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	228	86	93	59	140	94	540	1620	160	103	49
2	50	140	77	132	60	146	99	428	1260	141	110	54
3	39	109	66	138	63	143	101	302	1060	142	102	64
4	48	109	65	136	56	143	107	296	897	146	99	64
5	52	103	65	140	56	142	122	344	857	316	97	61
6	52	96	66	114	55	139	139	270	1500	246	89	53
7	51	97	64	64	54	139	138	281	2070	145	84	49
8	52	105	63	65	55	136	133	348	2340	140	77	55
9	52	104	57	68	56	129	130	293	2540	134	102	50
10	49	100	60	66	54	130	122	208	2400	111	78	53
11	44	92	58	66	55	129	116	155	2290	106	71	54
12	56	91	58	68	53	129	122	350	2380	115	68	55
13	66	89	60	86	54	129	123	450	2710	110	65	50
14	55	86	61	127	52	126	88	443	3370	103	60	51
15	42	97	61	127	51	125	74	533	3380	94	55	51
16	39	92	62	128	52	125	71	762	2930	88	59	56
17	35	85	63	128	53	123	70	964	2450	81	68	57
18	33	80	64	128	55	124	64	1040	2110	76	68	51
19	32	72	64	129	59	129	52	1030	1640	81	67	49
20	31	84	61	129	59	132	53	1140	1520	87	67	50
21	31	89	60	127	67	106	74	1130	1380	89	55	57
22	30	86	59	129	76	90	309	1200	1110	89	56	62
23	29	94	63	132	75	89	519	1410	740	94	62	63
24	28	96	59	128	81	109	394	1660	483	82	66	63
25	27	88	53	126	88	127	263	1660	344	73	63	58
26	27	82	57	129	100	115	347	1280	247	73	55	53
27	41	86	55	128	105	99	501	1230	216	73	50	56
28	175	93	52	78	124	89	490	1380	200	73	50	56
29	327	94	54	65	---	85	533	1470	181	71	48	55
30	319	90	56	62	---	88	640	1920	163	75	51	63
31	323	---	54	60	---	96	---	1840	---	112	51	---
TOTAL	2291	2957	1903	3296	1827	3751	6088	26357	46388	3526	2196	1662
MEAN	73.9	98.6	61.4	106	65.2	121	203	850	1546	114	70.8	55.4
AC-FT	4540	5870	3770	6540	3620	7440	12080	52280	92010	6990	4360	3300
MAX	327	228	86	140	124	146	640	1920	3380	316	110	64
MIN	27	72	52	60	51	85	52	155	163	71	48	49
CAL YR	2009	TOTAL	51731	MEAN	142	MAX	1350	MIN	27	AC-FT	102600	
WTR YR	2010	TOTAL	102242	MEAN	280	MAX	3380	MIN	27	AC-FT	202800	

MAX DISCH: 3510 CFS AT 18:30 ON Jun. 14,2010 GH 7.88 FT. SHIFT -0.13 FT.

MAX GH: 7.88 FT. AT 18:30 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CACHE LAPOUDRE RIVER AT GREELEY WASTEWATER PLANT
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06754000 SOUTH PLATTE RIVER NEAR KERSEY
Water Year 2010

Location.--	Lat. 40°24'45", Long. 104°33'47", in NW ¼ SW ¼ sec. 9, T.5 N., R.64 W., Weld County, Hydrologic Unit 10190003, on downstream side of bridge on State Highway 37, 1.9 mi north of railroad in Kersey, and 2.5 mi downstream from Cache la Poudre River.
Drainage and Period of Record.--	9,659 mi ² . May 1901 to Dec. 1903, Mar. 1905 to current year. Monthly totals only for some periods. Periodic water-quality data available from 1950.
Equipment.--	Sutron AccuBubble stage sensor equipped with a muffler-style orifice in the stream connected to a Sutron DCP in a concrete block shelter on downstream left side of State Highway 37 bridge. A Sutron CFB stage sensor attached to the bridge is used as a back-up. A wire weight gage is used for referencing both the AccuBubble and the CFB. A supplemental 0 to 6.6 ft staff gage is installed on the closest bridge pier.
Hydrologic Conditions.--	The Kersey gage reflects general trends of drought or abundance throughout the South Platte basin. It is the first gage below the confluences of all mountain snowmelt tributaries of the South Platte. In a low to average year this native water supply is largely captured for agricultural and municipal uses before it reaches Kersey. In this full use scenario, the Kersey gage records return flows and water passed downstream for senior users. In a year with above average snowmelt, the Kersey gage will see high water during runoff. The 25-year average for 1976-2000 was a yearly total of 914,000 acre-feet. This year saw a total of 949,000 acre-ft., making it an average year. The Kersey peak flow and a significant portion of the total flow in dry years often comes from front range rainstorms. These storms are often seen as sharply rising hydrographs that peak in the evening. In drought times, this storm runoff is most welcome to the irrigators along the South Platte in Eastern Colorado.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from the AccuBubble. The CFB data was not used in any way for the 2010 record. The CFB orifice line was bad and high flows did not permit installation of a new line until September 2010. Any data due to missed transmission was filled in from the DCP log. The record is complete and reliable, after the following adjustments. The AccuBubble data had occasional spikes, presumably due to sand on the muffler. These spikes were identified on monthly GH graphs and were assumed to be bad data. One or two hourly values were adjusted in the record on October 2, 27; December 10-12, 22, 23; January 4, 9, 16, 24, 26, 28; February 3, 8, 14, 15; and March 14, 31. These edits did not result in greater than 5% change in any daily flows, and were not considered to influence the record accuracy. Calibration was maintained by 73 wire weight readings made during measurements and visits to the gage. With one exception, calibration was good. Corrections applied to the record ranged from -0.03 to +0.01 ft and were distributed within the record, with no correction greater than +/- 0.02 ft. magnitude between visits. The exception occurred between May 3, when a +0.04 ft. calibration correction was made and May 11, when a -0.06 ft. calibration correction was made. The plus to minus corrections hinted that the May 3 adjustment may have been in error, but the full corrections were used for lack of any additional information. Neither the +0.04 nor the -0.06 ft corrections changed a daily flow more than 5% from a zero correction, so the record was still considered good. Calibrating the bubbler is sometimes difficult since instantaneous readings can be affected by the sand on the orifice muffler. Sand effects were presumed to be minimized by the Sutron unit's daily auto-purge. On some visits, the AccuBubble self-corrected a hundredth or two when continuous live-readings were taken for 5-10 minutes. These adjustments were not considered as record corrections. Sometimes the average value for the hour needs to be considered for calibration purposes, but this was not necessary in 2010. The channel was ice-free during the winter. For future reference, listed below are common issues with data at this gage. Differences between the instrument and the wire weight are not corrected until they have been observed to be consistent for several visits. When corrections are made every visit, then it is not uncommon to see compensating plus and minus corrections on successive visits. If this occurs, then record datum corrections must be distributed by assuming that some adjustments were made in error. The Acububbler is subject to spiking or "painting" due to sand. Before recording an instrument reading when sand problems are suspected, it is wise to force a purge or do a more sustained air injection by keeping the instrument on "live reading". Rarely, the muffler is uncovered and visible from above on the bridge. It is useful to note this condition in visit remarks, as this eliminates sand as a consideration. Readings for storm peaks at this gage are problematic since high water manifests as unsteady flow. The pier staff can be observed to rise and fall several tenths of a foot in a few minutes. Presumably this is due to the variable resistance of vegetation in the high water channel. In the record data, it is not possible to distinguish whether a data spike is due to sand/painting or a legitimate reading of unsteady flow. For high water, the GH plot can be used to provide useful average GH's. During cable measurements, wire weight readings should be made every 15 minutes, corresponding to data collection.
Datum Corrections.--	Levels were last run on September 13, 2005 using B.M. 1 as base. No changes were made.
Rating.--	Low water control is a channel constriction and sand channel bed about 150 ft downstream from the gage, where pilings exist on the left bank for an old bridge. During very low flow the channel bed is stable. Channel bed changes occur by time for sustained low and medium flows. A large peak will change the channel and result in a new pattern of shifts for lower flows. Brush and trees in the overflow areas cause backwater at high stages. The channel at the gage appears to be widening over time. Review of the measurement history indicates that the GH for 10,000 cfs has been gaining a foot every 10-15 years. Rating No. 24 is new this year, and is defined by measurements from 281 to 11000 cfs. Historic measurements run higher and lower and were used for trends. Twenty measurements (Nos. 1033-1052) were made this year ranging in discharge from 281 to 11000 cfs. They cover the range in daily discharge experienced except for the lower daily flows on August 30-31; and higher daily flows on June 14-15. The peak discharge of 11900 cfs occurred at 1300 June 14, 2010 at a gage height of 10.39 ft. (gage height correction of -0.02 ft applied) with a shift of -0.01 ft. It exceeded measurement 1044 made on June 13, 2010 by 0.38 ft in stage.

Discharge.--

Shifting control method was used. Shifts are caused by sand movement, vegetation, and the effects of the bridge piers. Measurements showed unadjusted shifts ranged from -0.09 ft to +0.13 ft. All measurements were given full weight. Shifts were distributed by time. Stage-shift plots showed equal plus and minus scatter with no clear trends. Within the time distribution, consideration to stage change and the effects of high water peaks was also given during the following periods. The +0.01 ft shift for the March 3 measurement was held for stage to March 19. The -0.03 ft shift for the April 5 measurement was held for stage to April 22. Between April 22 and the May 3 measurement, weight was put on an event peak on April 24. Between May 3 and May 11, a large shift change was seen, with possible stage-shift effects. However, the stage dropped with time monotonically and somewhat linearly. Time shifts approximated a stage distribution, so stage shifts were not needed. Between the May 11 and June 10 measurements, weight was put on an event peak on May 13. The -0.01 ft shift for the June 13 measurement was held for stage until June 15. The +0.07 ft shift for the July 1 measurement was held for stage until July 5. The +0.02 ft shift for the July 9 measurement was held for stage backward in time until July 7. Distribution between the July 27 and August 9 measurements was adjusted to run most of the change through the runoff event period August 4-9.

Special Computations.--

A hydrograph was plotted.

Remarks.--

The record is rated as good. Station maintained and record developed by Bob Cooper.

Recommendations.--

In September 2010 a new orifice line was installed for the CFB. The CFB appears to be tracking OK; the data should be useful. In 2011, the AccuBubble and CFB data should be compared to see which would be better for the record. Levels should be run in 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06754000 SOUTH PLATTE RIVER NEAR KERSEY

RATING TABLE--

PLAKERCO24 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

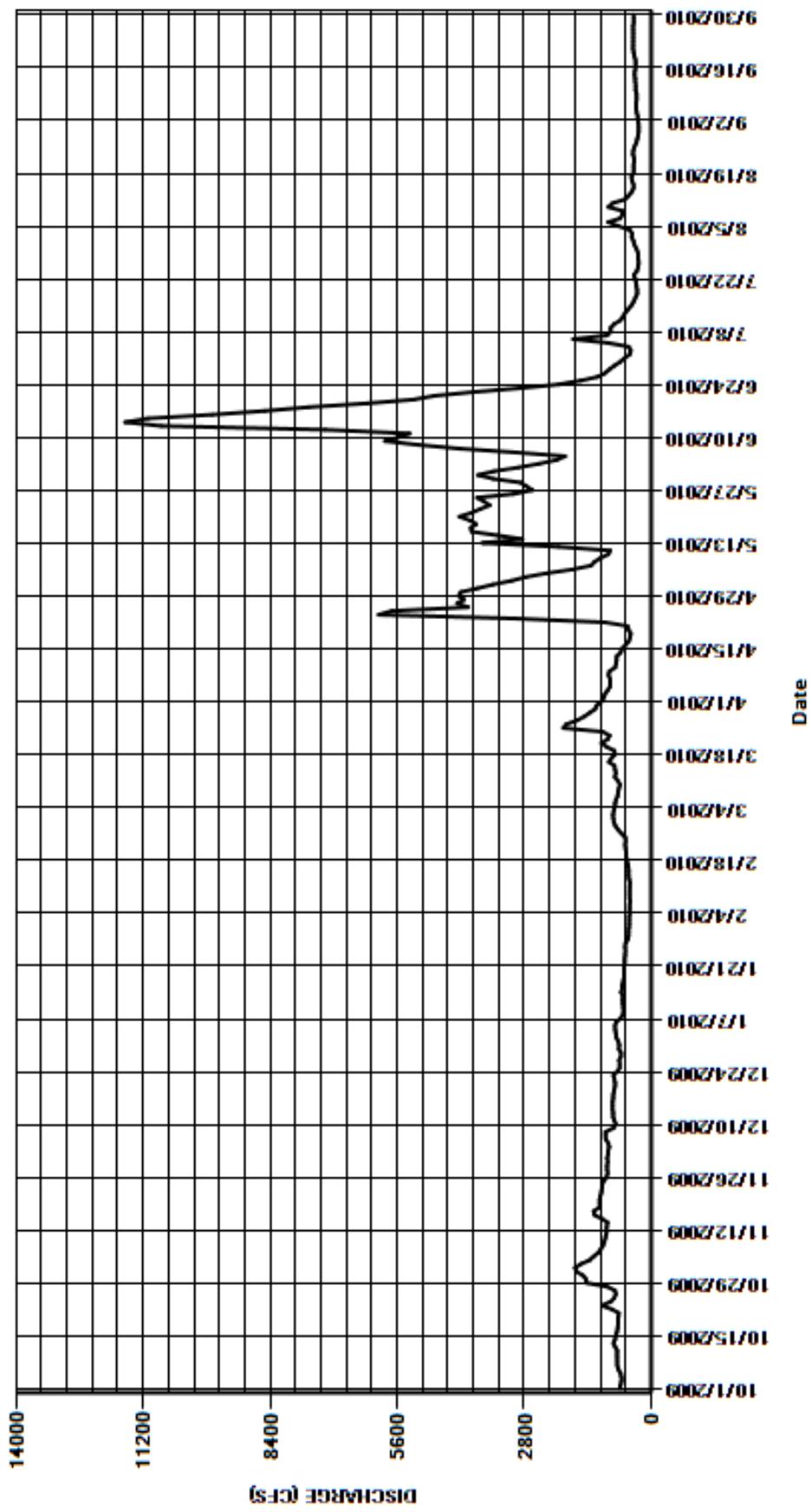
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	691	1650	972	727	484	835	1100	3830	3470	582	393	281
2	677	1680	955	771	483	843	1050	3490	2930	470	430	295
3	656	1550	951	780	484	828	1020	3080	2470	454	423	297
4	659	1360	929	794	475	807	961	2760	2080	496	481	321
5	675	1270	945	803	480	796	905	2300	1900	949	738	332
6	721	1170	1000	778	476	780	905	1730	2990	1720	949	337
7	746	1110	1010	682	468	738	909	1330	4220	975	683	327
8	748	1060	1010	623	474	732	940	1250	5140	892	633	326
9	751	1030	832	613	479	713	925	1120	5870	897	641	324
10	756	1010	780	616	474	688	797	946	5580	819	947	346
11	746	990	814	630	475	736	775	903	5330	677	854	344
12	794	982	840	633	469	804	766	2050	7190	619	581	351
13	834	978	840	624	490	780	760	3720	10800	573	501	355
14	799	963	852	664	499	798	676	2840	11600	502	432	367
15	780	1090	853	636	498	812	644	3380	11100	433	391	360
16	756	1250	851	638	503	935	566	3960	9680	386	394	346
17	739	1270	838	613	520	876	493	3980	8520	349	423	348
18	733	1140	834	602	536	801	468	3860	7550	312	438	351
19	735	1140	819	601	554	814	452	4000	6260	311	392	371
20	724	1140	801	602	550	981	501	4230	5240	324	388	388
21	713	1120	800	594	566	1100	525	3960	4780	336	388	403
22	863	1100	810	584	573	960	1030	3770	3910	357	380	398
23	1090	1090	836	584	567	919	2990	3560	2910	385	381	396
24	895	1080	749	574	571	1070	6010	3690	2040	318	403	396
25	815	1050	695	569	653	1940	5720	3840	1560	288	395	393
26	782	984	698	575	727	1870	4040	3040	1190	280	369	398
27	800	963	707	568	788	1640	4280	2620	1020	283	330	400
28	972	971	668	518	824	1480	4130	2750	921	288	309	386
29	1430	974	668	502	---	1360	4240	2880	810	296	288	386
30	1440	960	716	498	---	1240	4200	3480	682	328	278	394
31	1510	---	704	493	---	1200	---	3820	---	371	276	---
TOTAL	26030	34125	25777	19489	15140	30876	52778	92169	139743	16270	14909	10717
MEAN	840	1138	832	629	541	996	1759	2973	4658	525	481	357
AC-FT	51630	67690	51130	38660	30030	61240	104700	182800	277200	32270	29570	21260
MAX	1510	1680	1010	803	824	1940	6010	4230	11600	1720	949	403
MIN	656	960	668	493	468	688	452	903	682	280	276	281
CAL YR	2009	TOTAL	396634	MEAN	1087	MAX	6660	MIN	140	AC-FT	786700	
WTR YR	2010	TOTAL	478023	MEAN	1310	MAX	11600	MIN	276	AC-FT	948200	

MAX DISCH: 11900 CFS AT 13:00 ON Jun. 14,2010 GH 10.39 FT. SHIFT -0.01 FT. (-0.02 FT GH CORR. APPLIED)

MAX GH: 10.39 FT. AT 13:00 ON Jun. 14,2010 (-0.02 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06754000 SOUTH PLATTE RIVER NEAR KERSEY
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06758500 SOUTH PLATTE RIVER NEAR WELDONA
Water Year 2010

Location.--	Lat. 40°19'17", Long. 103°55'13", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, T.4 N., R.58 W., Morgan County, Hydrologic Unit 10190003, on left bank 875 ft downstream from bridge on State Highway 144, 2.8 mi southeast of Weldona, and 4.2 mi upstream from Bijou Creek.
Drainage and Period of Record.--	13,190 mi ² . October 1952 to current year.
Equipment.--	Graphic water-stage recorder and shaft encoder connected to Sutron SatLink DCP in a corrugated metal pipe and stilling well. An electric tape gage inside the station is the primary reference gage. A supplemental Sutron constant flow bubbler (CFB) stage sensor was installed after the end of the 2009 water year. A low-water staff gage was placed near the orifice line on September 9, 2010. The datum of the staff was not verified by levels but was established with respect to the electric tape gage reading.
Hydrologic Conditions.--	Water year 2010 showed average or slightly above average water supply for the South Platte basin. The total at this gage was 685,100 Acre Ft. The most severe drought year recently was 2002 with 166,100 acre-feet. The last high flow year, 1995, produced about 695,000 acre-feet. Water supply comes from runoff and irrigation return flows from the Front Range tributaries. Flow at the gage is heavily influenced by demands of water rights.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data taken from satellite monitoring with chart back up. The record is complete and reliable, except for August 14-15, when flow was possibly below inlets and the gage isolated. To achieve complete and reliable data, a number of periods required the use of back-up data from the chart and/or the use of large corrections. December 10-21, 2009: Encoder rises 0.16 ft, cause unknown, and is reset on December 21. Chart data are used for Dec. 10, 11 and corrected encoder data for December 12-21. Corrected data agreed very well with chart averages. January 7-February 2, 2010: Encoder falls 0.16 ft and is corrected again on February 2. The cause is unknown but likely a natural reversal of the first problem. The recorders use oil cylinders, and there was ice in the well. Chart data were used January 7, and corrected encoder data were used Jan. 8-Feb.2. Corrected data agreed very well with chart averages. August 5-9, 2010: Encoder failed and was replaced with a new instrument that was inadvertently set in reverse. Hourly data was developed from the chart and from a spreadsheet of primary data that incorporated a reversal correction. August 17, 2010: Three hours of data missing when chart was slipping. Hours were interpolated from adjacent data without loss of accuracy using trends from the chart. Encoder calibration was supported by 30 readings during the year. Other than the winter corrections and the reversal problem described above, only a few corrections of +/- 0.01 ft were needed.
Datum Corrections.--	Levels were last run on September 13, 2005 using R.M. 5 as base. No correction was made.
Rating.--	Section control is a shale outcrop about 100 ft below the gage. This shale ridge was exposed when the channel began to scour during the 2000-2004 drought years. It has proved to be a very effective control for low and medium flows. High flows have occasionally brought enough sand down the channel to cover up the shale, at which point the control is a channel constriction with a moving sand bed. High flows also spread out into relatively flat areas where vegetation has taken over in recent years. In high water, the channel splits in two opposite the station. During May and June high flows this year the channel created away from the gage scoured deeply. When flows receded, the far channel had become deeper than the gage channel and carried the majority of the flow. The gage channel continued to carry enough water (barely, at times) to measure a stage. Rating No. 19 was continued in use for 2010. It was created in 2006 and is defined by measurements from 78 to 16300 cfs. Below 650 cfs, Rtg 19 was created with 2006 measurements. The high water end was taken from an equation fit through historic points. Rating 19 was completely blown away by 2010 channel changes. Near zero shifts seen at the beginning of the water year became -0.75 ft shifts on the high end and +0.34 ft shifts on the low end by the end of the year. A new rating will be required for 2011, but this may prove frustrating as the channel is continuing to scour. No ice was observed in 2010, but during some ice periods backwater can arise from points downstream. At times, the channel visible at the gage can be ice-free, but exhibit a large negative shift from downstream conditions. Twenty measurements (309-328) were made this year ranging in discharge from 110 to 9550 cfs. The measurements cover the range of discharge experienced during good record except for the lower daily flows on October 3-8, April 18-19; and higher daily flows on June 16-17. The peak flow of 10500 cfs occurred at 0715 June 16 2010 at a gage height of 9.37 ft with a shift of -0.75 ft. It exceeded measurement No. 321 made on June 15 by 0.31 ft. in stage.
Discharge.--	Shifting control method was used all year. Measurements showed shifts ranged from -0.75 ft (high end) to +0.34 ft (low end). A stage relationship was seen. The high end shifts were caused by vegetative growth since the high flows of this magnitude were last seen in 2006. Low end shifts were caused by the scouring of a new low water gage channel to the south of the old one. Shifts were applied as follows. Shifts were applied by time for the periods: October 1-14, 2009 using Msmt 309 and the +0.02 ft shift in use on September 30, 2009; and, August 9—September 30, 2010, using Msmts. 325-329 made during the period and No. 330 made in WY 2011. While stage effects were no doubt present, the stage did not rise up into a zone where possible stage shifts would change the flows more than 5% over a time distribution. Also, the channel was scouring so much that each measurement would have required a separate table. Consideration to stage was given by holding shifts for events on August 11 and September 20. Shifts were distributed by stage for the following periods: October 14-November 6, 2009 using variable stage shift relationship PLAWEVST1_2010 based on Msmts. 309-311 made during the period and higher measurement No. 318. November 6, 2009—June 15, 2010 using variable stage shift relationship PLAWEVST2_2010 based on Msmts. 311-321 made during the period. Msmts. 313, 314, and 316 were adjusted up to 4% to better fit the stage shift relation. June 15—August 9, 2010 using variable stage shift relationship PLAWEVST3_2010 based on Msmts. 321-325 made during the period. Msmts. 324 and 325 were adjusted up to 4% to better fit the stage shift relation.

Special Computations.-- Computed discharge was used for August 14-15, but these days are considered estimated since the GH had flattened out at the level where the inlets are beached. Winter estimates were not needed in 2010.. For years with ice, estimates at Weldona typically use a mass balance from either the Kersey gage (upstream) or the Fort Morgan (USGS) gage and/or the Balzac gage (downstream). A spreadsheet with gage flows and diversions is used is used to calculate a base flow that should exist at the gage. This base flow is compared to record periods to estimate the gain between upstream and downstream gages. This gain estimate is plugged back in to compute estimates for periods of bad record. The use of figures from Kersey or Balzac can involve some effort to account for travel time between the gages. This can done by lagging the Kersey flow a day or by averaging succeeding daily flows at Balzac. A typical calculation would be:
PLAWELCO = BALZAC (2 day average) + DIVERSIONS – GAIN. The spreadsheet precision should not be confused with accuracy, since the gain is a guess and some of the diversion figures are ice-record estimates from the water commissioner. Estimates need to be rounded to at least the nearest 10 cfs to avoid the appearance of accuracy.

Remarks.-- The record is good, except for August 14, 15 which are estimated and poor. Station maintained and record developed by Bob Cooper.

Recommendations.-- The gage now operates on a separate channel which may go dry in very low flows. It may be necessary to relocate the gage further downstream or excavate the channel to move the water back to the gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06758500 SOUTH PLATTE RIVER NEAR WELDONA

RATING TABLE--

PLAWELCO19 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

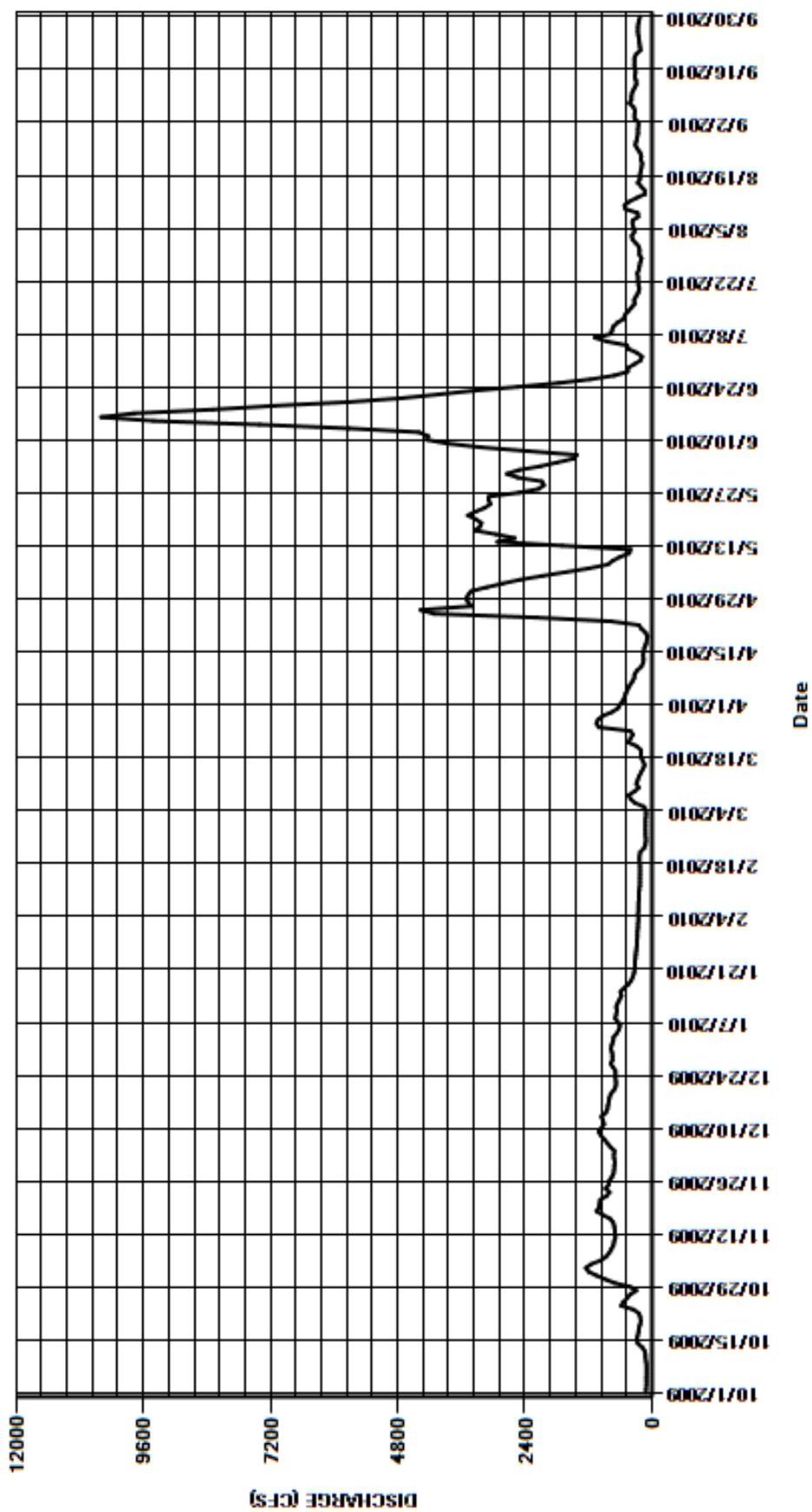
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	119	1050	701	760	267	121	606	3410	2740	216	307	260
2	114	1200	717	734	265	120	548	3120	2510	190	371	261
3	107	1250	718	729	259	110	518	2820	2110	283	381	331
4	106	1150	711	670	261	116	494	2490	1790	444	333	330
5	109	966	789	627	261	156	460	2070	1480	477	347	324
6	102	867	844	605	257	325	423	1630	1420	853	368	350
7	102	806	902	646	255	404	376	1190	2330	1080	366	426
8	103	767	962	695	253	444	338	836	3220	776	259	388
9	111	729	1010	680	251	333	331	743	3860	755	271	388
10	121	717	956	663	247	250	282	609	4250	729	501	370
11	124	693	909	678	240	296	202	430	4230	652	520	334
12	138	701	925	649	232	271	168	405	4400	536	430	296
13	184	705	958	611	228	244	161	1690	5720	513	289	303
14	267	713	875	579	228	209	170	2920	7410	449	128	327
15	291	733	844	597	226	169	158	2590	9410	387	143	314
16	272	791	832	530	224	140	146	2940	10400	329	204	319
17	255	926	816	448	226	170	113	3340	9780	340	270	334
18	250	1050	806	393	232	204	102	3250	8290	300	227	328
19	226	995	781	363	237	210	86	3220	7130	257	227	331
20	212	990	720	340	235	212	122	3330	5710	240	214	301
21	223	980	687	328	224	296	198	3480	4730	260	199	219
22	247	862	678	324	151	447	251	3330	4030	261	185	229
23	352	800	689	322	123	409	775	3160	3350	262	209	241
24	583	877	688	313	118	360	2180	3050	2530	282	202	245
25	541	819	688	307	119	409	4120	3080	1760	247	228	260
26	470	807	731	298	120	1010	4370	3080	1160	237	278	270
27	413	759	782	291	124	1050	3410	2510	714	220	319	267
28	296	727	744	285	121	1020	3470	2140	460	199	296	260
29	411	717	748	281	---	929	3510	2040	456	241	279	243
30	707	711	757	279	---	754	3470	2080	333	236	265	223
31	885	---	776	276	---	645	---	2530	---	245	266	---
TOTAL	8441	25858	24744	15301	5984	11833	31558	73513	117713	12496	8882	9072
MEAN	272	862	798	494	214	382	1052	2371	3924	403	287	302
AC-FT	16740	51290	49080	30350	11870	23470	62600	145800	233500	24790	17620	17990
MAX	885	1250	1010	760	267	1050	4370	3480	10400	1080	520	426
MIN	102	693	678	276	118	110	86	405	333	190	128	219
CAL YR	2009	TOTAL	243513	MEAN	667	MAX	4520	MIN	58	AC-FT	483000	
WTR YR	2010	TOTAL	345395	MEAN	946	MAX	10400	MIN	86	AC-FT	685100	

MAX DISCH: 10500 CFS AT 07:15 ON Jun. 16,2010 GH 9.37 FT. SHIFT -0.75 FT.

MAX GH: 9.37 FT. AT 07:15 ON Jun. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06758500 SOUTH PLATTE RIVER NEAR WELDONA
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
Water Year 2010

Location.--	Lat 40°21'28", long 103°31'43", in SW¼NE¼ sec. 33, T.5 N., R.55 W., Morgan County, Hydrologic Unit 10190012, on bank 4.3 mi northeast of Snyder, and 0.7 mi downstream from North Sterling Canal.
Drainage and Period of Record.--	16,623 mi ² . Oct. 1916 to present, prior to Oct. 1933: monthly discharge only.
Equipment.--	Graphic water stage recorder and shaft encoder connected to a Sutron 8210 DCP in a concrete shelter with a concrete stilling well. The gage is referenced with an electric tape. There is a supplemental outside wire weight gage and a supplemental constant flow bubbler.
Hydrologic Conditions.--	The South Platte River near Balzac CO is braided with heavily vegetated islands and banks. The channel at the current gaging site is divided by an island, a majority of the flow occurs on the North bank where the gage is located. In previous years the channel has been cutting towards the South, but turned North again after the June high water event. Much sand moves past the gage. Due to upstream senior calls on the South Platte during the irrigation season and North Sterling's call during the storage season, flows tend to remain low and somewhat controlled, except during storm events. As in previous years, the return flows continue to diminish as all available water above the gage gets diverted. The gage starts the reach of the South Platte River Compact. The legal importance is such that the gage is visited and flushed about every other day.
Gage-Height Record.--	The primary record is hourly averages of fifteen-minute data taken from satellite monitoring with chart and Constant Flow Bubbler backup. The record is complete and reliable, except for the days discussed below when the inlets were partially plugged. The gage tends to stay open because the flow has spilled over the North Sterling diversion dam, ½ mile upstream, but will freeze over occasionally. The record tends to have spikes due to the diversion activities upstream, and the use of water pumped from the stilling well for flushing the inlets. The primary data is checked closely for bad values that might occur when the well has been briefly drawn down by the flush pump. A corrected value is inserted when this occurs. Also, when a small flush correction occurs, and it is obvious from the chart that only a few hours of plugged inlet occurred, then corrected values are inserted for these hours--without considering them to be estimates. This occurred on many days. Record had to be estimated on the following days when partially plugged or malfunctioning inlets required a substantial GH correction: October 12, March 8, 26, April 8, 12, 23, May 22, June 14, 16, August 9, 10, 22, 23 . The number of hours corrected varied between 3 and 6. Due to inlet problems, bubbler record was used for the following periods: 1400 October 1 to 1500 October 3, 0000 July 5 to 0800 July 6, 1700 September 16 to 1100 September 18. The July period had serious inconsistency between the stilling well and bubbler data. The bubbler followed trends for North Sterling Canal diversion better, but the potential for error was great enough to consider the record poor. Calibration corrections were pro-rated through the October and September periods based on comparison to stilling well data at the beginning and end of each period.
Datum Corrections.--	Levels were last run on July, 27, 2009. After corrections applied in WY 2009 record, the wire weight and inside tape read correctly.
Rating.--	The control is a rapidly shifting sand channel with flow in several braids at low stages. At very high stages, the flow spreads into heavily vegetated areas. Rating No. 4 is new this year. It was originally developed from measurements made in WY 2009 and put into use on Oct 1, 2009. The rating was extended on Jun 15, 2010 to improve the accuracy of real time data for the higher flows of measurements 593 (6560 cfs) and 594 (7940 cfs). This proved futile as the channel scoured heavily with continued high flow. So measurements 593 & 594 made June 14-15 had near zero shifts while measurements 595 (10,500 cfs) & 596 (10,300 cfs) made June 17-18 ended up with +0.70 ft and +0.80 ft shifts. The new rating did result in mostly single digit shifts for 8 months of WY2010, however, a rare occurrence at this gage. Thirty two measurements (Nos. 575 - 606) were made this year ranging in discharge from 25.6 to 10,500 cfs. They cover the range in discharge experienced except for the lower daily flows of February 6 – 21. The peak flow of 10600 cfs occurred at 1130 June 17, 2010 at a gage height of 9.75 ft with a shift of 0.75 ft (this shift was an adjusted average from measurements 595-596 made on June 16 and 17). It exceeded measurement No. 595, made that day, by only 0.01 ft in stage.

Discharge.--

Shifting control method was used all year. Shifts are caused by movement of sand released from the North Sterling diversion, and at larger flows by vegetation. There are groves of young willow and cottonwood trees growing in half of what used to be the bank full channel. Shifts were applied as defined by measurements and distributed by both stage and time. Typically many stage-shift tables are required to work the record at this gage since the level of sand at low water changes every time the river rises. Open water measurements show unadjusted shifts varying between -0.28 and 0.80 ft.

Shifts were distributed as follows. Oct 1-14, 2009, shift distribution by time using Measurement Nos. 574-575. Oct 14, 2009 -Dec 16, 2009, shift distribution using variable stage-shift relationship PLABALCOVST1001 based on Measurements Nos. 574-579 made during this period, as well as lower flow No. 582 and higher flow No. 591. Measurement No. 576 (4.07%), No. 577 (-3.03%), No. 578 (-2.12%) and No. 591 (0.37%) were discounted to better fit the table. Dec 16, 2009-Feb 5, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1002 based on Measurements Nos. 579-582 made during this period as well as No. 591 for the higher flows. Measurement No. 580 (2.20%) and No. 591 (0.37%) were discounted to fit the relation. Feb 5-April 5, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1003 based on Measurements 582-586 made during this period, as well as Nos. 589, 591 and 592, which were used to define the higher end of the table. Measurements with adjusted shifts were No. 583 (-3.86%), No. 584 (-3.57%), No. 585 (3.57%), No. 586 (0.93%), No. 591 (0.37%) and No. 592 (1.22%). April 5-26, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1004 based on Measurements 586-589 made during this period, plus Measurements No. 591 and 592 that were used in PLABALCOVST1003. Measurements No. 589 (0.19%), No. 591 (0.37%) and No. 592 (1.22%) had adjusted shifts. Apr 26-Jun 15, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1005 based on Measurements 589-594 made during this period. No. 588 used in the previous table was incorporated into this table to define the lower end of the table. Measurements with adjusted shifts used in this table were No. 591 (0.37%), No. 592 (1.22%) and No. 593 (-3.24%). From 1600 Jun 15 to 1038 Jun 17, 2010 shifts were prorated by time using Measurement Nos. 594-595. Channel was scouring heavily during this period, and the shift difference was prorated from -0.01 ft to +0.75 ft. Measurement 595 was discounted -1% to equalize shifts at peak flows. Jun 17-Jul 1, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1006, based on Msmts 595-599 made during this period. Measurements 595 and 596 were discounted -1%, and 1%, respectively, to use the same shift to define high flow. Flow for these two measurements included some heavily vegetated areas that were problematic to characterize. Jul 1-Aug 9, 2010, shifts were distributed prorated by time using measurements 599-601 without adjustment. Measurement 601 (Jul 28) shift was held until 1800 Aug 9 when an event occurred initiating the start of PLABALCOVST1007. Aug 9-Sep 7, 2010, shift distribution using variable stage-shift relationship PLABALCOVST1007 based on Measurements 601-604 made during this period. Measurement 597, used previously, was used to define the high end. Measurement No. 602 (2.35%) and No. 603 (-4.21%) were discounted to better fit the table. Sep 7-30, 2010, shift distribution by time using Measurement Nos. 604-607 without adjustment.

Special Computations.--

Hourly gage heights for the days of plugged inlets or ice cover were estimated graphically on the chart. The new computed daily discharge was compared to the old discharge and depending on the percentage of change in discharge, the record was considered either good, fair or poor.

Remarks.--

Record is good to fair, except for July 5-6, which are poor due to inlet and/or instrument issues. Channel and rating instability will always be an issue at this gage. Station maintained and record developed by Robert D. Erosky.

Recommendations.--

Graphs of the North Sterling diversion data would be sometimes helpful in estimating GH for periods of plugged inlets. A great deal of effort is required to get a good record at this gage due to the movement of large amounts of sand in the channel. Vigilant visits and measurements are a must.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC

RATING TABLE--

PLABALCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	166	1110	388	812	141	160	569	3350	2090	127	158	252
2	156	1260	538	760	128	131	529	3260	1980	30	202	257
3	147	1310	530	726	75	168	506	2690	1740	32	267	293
4	141	1330	558	710	30	149	477	2310	1360	186	298	331
5	147	1180	625	620	26	160	430	1940	1060	326	295	320
6	150	546	778	563	25	236	371	1590	829	273	284	266
7	137	337	890	636	24	381	328	1170	1270	531	268	267
8	144	279	930	723	23	471	284	738	2130	290	257	342
9	158	257	739	761	22	491	254	460	2870	245	191	317
10	189	225	463	630	22	362	238	286	3570	267	448	330
11	194	212	458	520	22	329	198	123	4030	361	555	314
12	195	228	655	492	22	310	144	139	4550	508	482	294
13	244	237	1010	462	21	284	120	402	5240	461	381	285
14	285	284	1110	414	21	249	119	1860	6550	378	282	316
15	340	316	1060	388	20	179	116	2280	7780	311	208	202
16	338	289	924	376	19	156	87	2220	9340	255	182	116
17	331	392	937	340	19	156	71	2760	10500	229	223	92
18	327	634	985	280	19	179	70	2850	10000	268	220	79
19	283	628	999	228	19	188	69	2980	9330	233	191	65
20	259	603	864	209	19	148	64	3030	8190	209	178	60
21	302	602	692	206	18	129	56	3140	7040	212	171	57
22	355	596	675	205	223	234	104	3110	5990	211	174	54
23	367	432	666	205	307	343	325	2860	4480	187	183	53
24	551	409	661	207	291	312	1260	2710	3170	146	192	50
25	670	443	741	188	285	278	2550	2590	1970	145	194	49
26	586	377	892	182	282	443	4350	2700	1340	139	212	46
27	529	324	860	188	278	978	3320	2500	843	135	240	56
28	488	273	910	176	279	985	3150	1850	451	132	248	44
29	438	269	913	165	---	918	3190	1620	233	133	244	42
30	671	278	826	157	---	802	3350	1580	186	148	243	42
31	981	---	848	157	---	636	---	1760	---	153	240	---
TOTAL	10269	15660	24125	12686	2680	10945	26699	62858	120112	7261	7911	5291
MEAN	331	522	778	409	95.7	353	890	2028	4004	234	255	176
AC-FT	20370	31060	47850	25160	5320	21710	52960	124700	238200	14400	15690	10490
MAX	981	1330	1110	812	307	985	4350	3350	10500	531	555	342
MIN	137	212	388	157	18	129	56	123	186	30	158	42

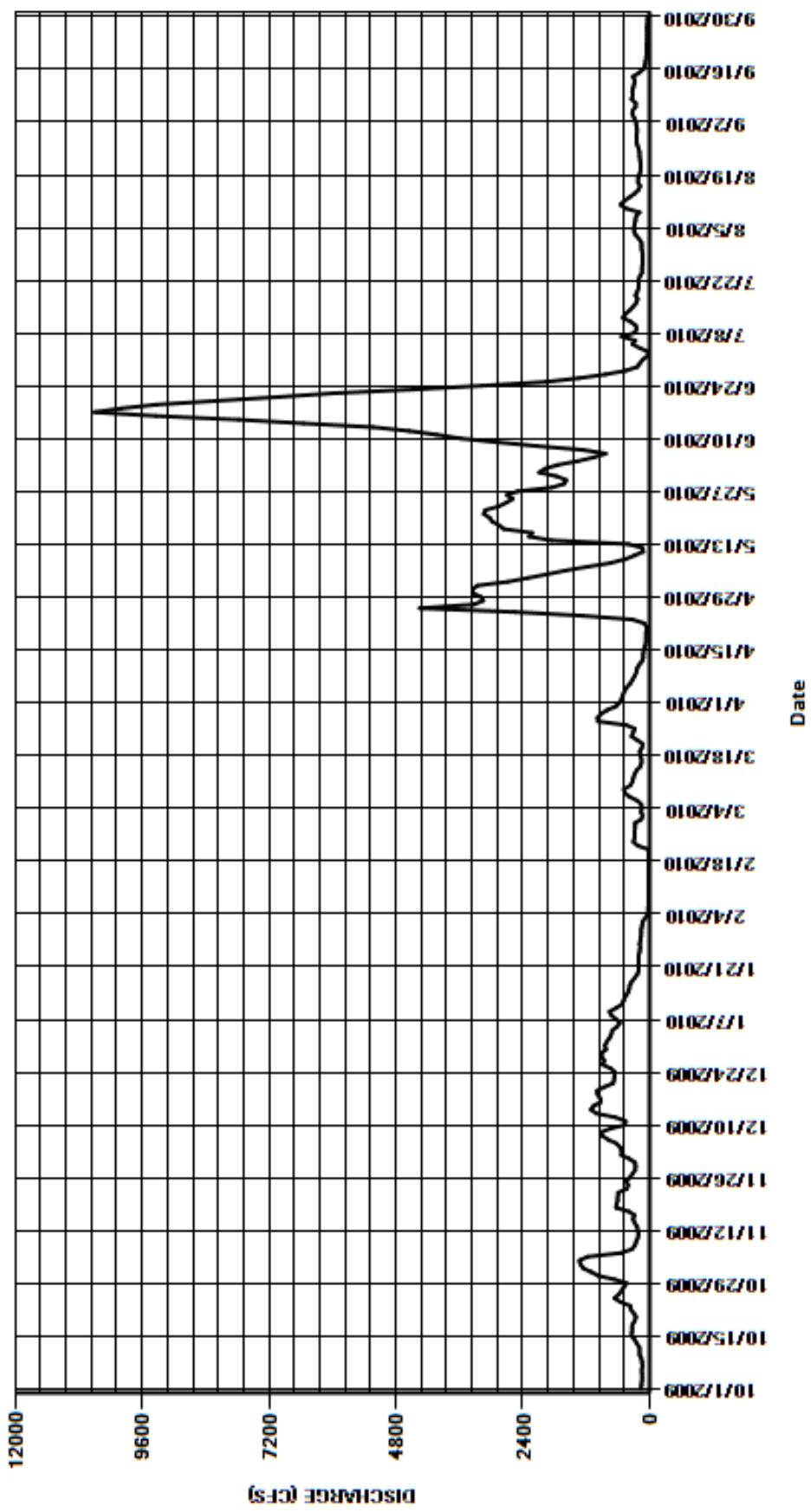
CAL YR	2009	TOTAL	200079	MEAN	548	MAX	4280	MIN	10	AC-FT	396900
WTR YR	2010	TOTAL	306497	MEAN	840	MAX	10500	MIN	18	AC-FT	607900

MAX DISCH: 10600 CFS AT 11:30 ON Jun. 17,2010 GH 9.75 FT. SHIFT 0.75 FT.

MAX GH: 9.75 FT. AT 11:30 ON Jun. 17,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

Water Year 2010

Location.--	Lat. 40°58'37", Long. 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., Sedgwick County, on right bank of channel No 2 (right channel) 5 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage and Period of Record.--	23,821 mi ² . April 1902 to current year. Monthly data only for some periods. Published as near Julesburg and at Ovid in earlier years. Water quality data available from 1945 to 1995.
Equipment.--	Sutron AccuBubble stage sensor connected to a Sutron 8210 DCP. A wire weight gage on the bridge is the primary reference gage.
Hydrologic Conditions.--	The South Platte channel at Julesburg is braided. Channel 2 is one of four channels. The river is gaged on channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg. (The gage on Channel 4 has not been functional due to ponding conditions. GH's were not recorded at Channel 4 but a record was estimated. Channel 4 receives intermittent runoff from agriculture and storms, and in some years there is well augmentation water delivered down the channel.) Generally the river is dried up by diversions at many points upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). During the winter, however, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. However, upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations. Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, nearly all the flow is in Channel 1 with Channel 2 being dry. Channel 2 remained mostly dry for most of 2010, but did see flow in the summer months during a period of high flow in Channel 1. Flow did get high enough in the winter of 2009-2010 to see flow in Channel 2.
Gage-Height Record.--	The primary record is the hourly averages of 15-minute satellite data with DCP log as backup. The record is complete and reliable, except for December 19-24, 2009, January 1-3, 6-8, 17-21, 2010 when the gage was ice affected. On March 3 and July 10, 2010, there were short periods (1-4 hours) of intermittent missing data. Missing gage heights were interpolated between periods of good record with no loss of accuracy. During the periods May 6-9, 13-16, 2010, the bubbler malfunctioned. Gage heights were estimated from adjacent good record for May 6-9. Spikes of bad data were removed from May 13-17 by correcting 1 to 5 hours each day, using adjacent good record. The GH graph trends were clear enough during May 13-17 to conclude that the adjustments made restored this period to good record. Many observations of zero flow were made and a gage height of 3.33 ft was the highest observed zero flow. Instrument calibration was supported by 38 visits to the gage. Periods of no flow the adjustments to the instrument were prorated over time. Periods of flow were: October 29- November 2, hold correction of 0.04 ft for the start of water; November 2-9, prorate 0 to -0.01 ft correction; December 15-17, hold correction of 0.03 feet for the start of water; April 27-29, hold correction of 0.06 ft for start of water (the 0.06 ft correction was then further prorated to a 0.07 ft correction on April 30, and the 0.07 ft correction was held until May 6); May 9-21, a -0.04 ft correction was prorated over time; June 15-22, a correction of 0.04 ft was prorated over time; June 22-25, a correction of -0.04 ft was prorated over time and held to June 28; June 28- July 3, the -0.04 ft correction was prorated to -0.08 ft at the end of flowing water. Calibration was generally good. An initial correction was required for the flow periods. This was likely due to attempts to calibrate the bubbler during the previous period of zero flow when there was not a good connection between the water at the wire weight and the orifice. Calibrations noted or made during zero flow were not applied to the record.
Datum Corrections.--	No levels was run in 2010. The wire weight was set by levels on April 10, 2004, after having been removed for bridge maintenance.
Rating.--	The control is the sand channel which has historically exhibited scour and fill activity. Flow in the channel has been infrequent in recent years, resulting in marsh like conditions at the gage without visible flow. Low flow control is also regularly confounded by grooved tracks of 4-wheel drive vehicles in the semi-dry channel just below the gage. Rating No. 20 was developed this year, using ten measurements (Nos. 378-387) made by Colorado and Nebraska personnel. Rating 20 is defined by measurements ranging in discharge from 25.2 to 4990 cfs made in 2010. Computed flows below 16.8 cfs (25.2/150%) and above 7480 cfs (4990 X 150%) should be considered estimates. There were many daily flows below range in WY2010. The peak flow of 5200 cfs occurred at 0930 June 21, 2010 at a gage height of 8.71 ft (gage height of +0.04 ft applied) with a shift of 0.02 ft. It exceeded Meas. No.386, made June 22, 2010 by 0.05 ft. in stage and 210 cfs.
Discharge.--	Most shifts here are due to backwatering caused by the constant and abundant vegetative growth in the channel during the last few dry years. In the old, clean channel, shifts were caused by the movement of sand. Shifts are also affected by the degree to which water spills into channels 3 and 4 which are not gaged, but which are included in measurements. Near zero discharges were determined using straight applications of measured shifts to the rating, and not by observations. Measurements show unadjusted shifts ranged from -0.15 to +0.18 ft. The high and low shifts (both Nebraska Measurements) were adjusted 6% so that the range of applied shifts was -0.09 ft to +0.14 ft. No other measurements were adjusted. Shifts were distributed by time with consideration of stage as follows. Oct. 1-Nov. 2, shift from Nov 2 (-0.07 ft) was applied back to compute zero flow in October. Nov 2-9, shifting by time using measurements 378-379 made during this period. Nov. 9-19, hold shift from Measurement 379 until zero flow computed. Nov. 19-Dec. 6, shifting by time using Measurements 379-380 during no flow period. Dec 6-15, apply Dec. 15 shift (-0.09 ft) back to compute zero flow on Dec. 6 . Dec. 15-Jan. 4, shifting by time using Measurements 380-381 made during this period. Jan. 4-24, hold shift from Measurement 381 until zero flow computed. Jan. 24-April 27, shifting by time using Measurements 381-382 during no flow period. April 27-29, shift from April 29 (-0.09 ft) was applied back to compute zero flow on April 27. April 27-June 3, shifting by time using Measurements 382-385 made during this period. June 3-9, hold June 3 shift for stage consideration. June 9-28, shifting by time using Measurements 385-387. June 28-Sept. 30, hold shift of Measurement 387 to compute zero flow .

Special Computations.-- Discharge on ice affected days was estimated from adjacent good record using graphs where obvious ice 'peaks' had been removed. Discharge for December 19-24 and January 1-3, 6-8, 17-21 was computed from GH's estimated from visit data and adjacent good record. Discharges for March 3 and July 10, 2010 were computed after 1-4 hours of missing data was interpolated from good record. Discharge for May 6-9 was computed from GH's estimated from adjacent good record. Discharge for May 13-16 was estimated by removing spikes of bad GH from the data. Discharge is considered estimated for the following days for which computed flow was below the effective definition of the rating (16.8 cfs): October 29-31, November 1, 10-20, December 15, 16, 26-29, January 8, 9, 13, 14, 21-23, May 14, 15, July 3. This record is added to the records from channels 1 and 4 to form the record for the South Platte River at Julesburg, Combined flow. Most zero flow periods were confirmed by observation, but the near zero flows computed from shift and datum application were not observed. Near zero flows computed were considered estimates anyway, since they were below the effective range of the rating (16.8 cfs). Measurements made at Channel 2 include water found in Channels 3 or 4 at high flow. Channels 3 and 4 are not gaged. Channel 4 used to be gaged and a separate record is still maintained for interstate compact purposes. However, this "Channel 4" record is a paper record which totals small inflows from the Julesburg Town Effluent and Julesburg Town Return Ditch. When river flow is high enough to spill into the Channel 4 swamp, this water is incorporated into the Channel 2 measurements and discharges .

Remarks.-- The record is good, except for periods of ice affected record which are estimated and poor; periods of instrument malfunction, which are estimated and poor; and periods of flow below 16.8 cfs, which are estimated and poor due to lack of rating definition. Station maintained and record developed by Devin Ridnour and Bob Cooper.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

RATING TABLE--

PLAJURCO20 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

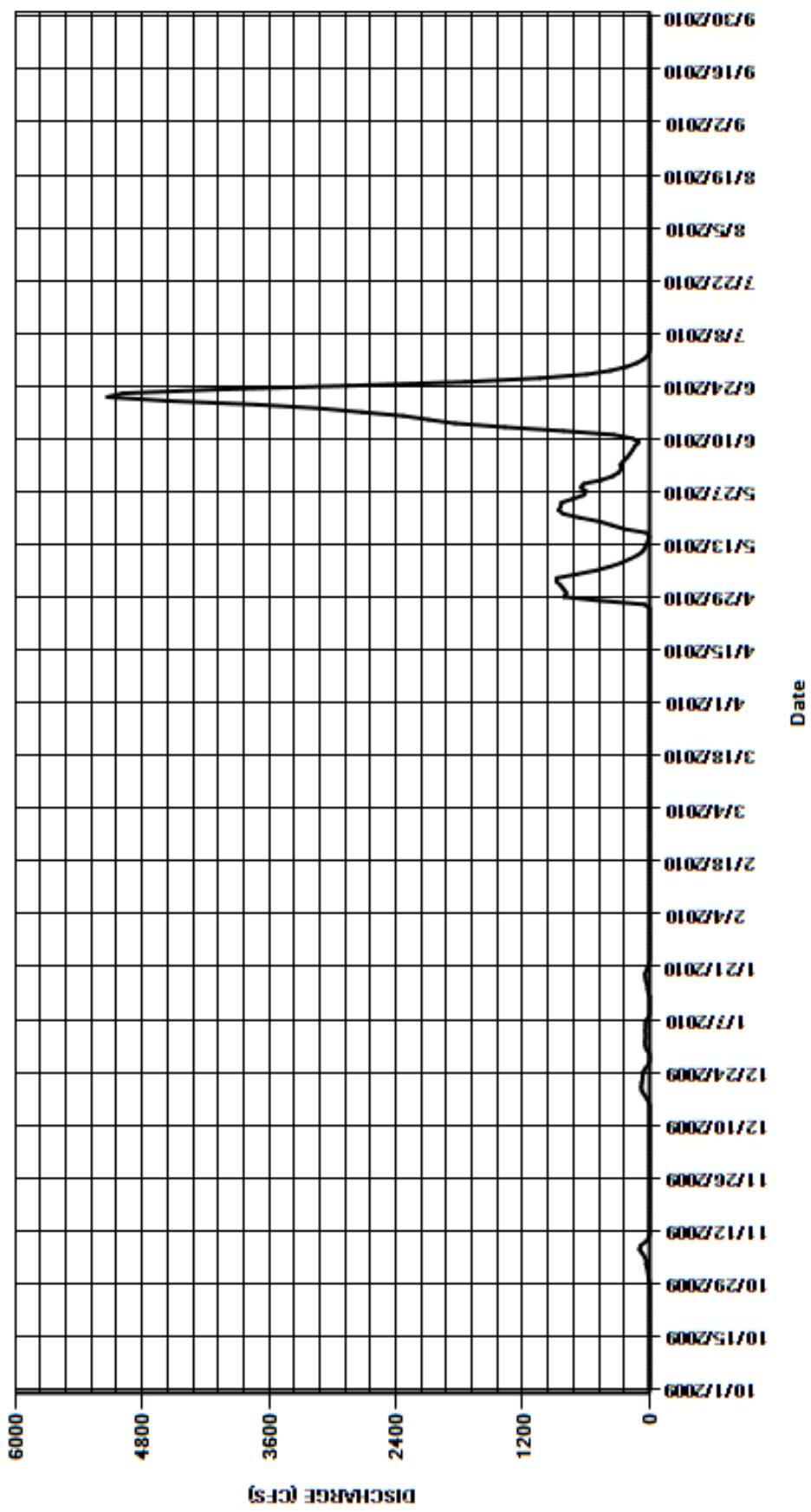
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	16	0	45	0	0	0	813	293	58	0	0
2	0	24	0	40	0	0	0	839	265	19	0	0
3	0	35	0	40	0	0	0	879	279	3.1	0	0
4	0	32	0	42	0	0	0	879	248	0	0	0
5	0	49	0	40	0	0	0	690	212	0	0	0
6	0	72	0	40	0	0	0	510	186	0	0	0
7	0	96	0	25	0	0	0	380	159	0	0	0
8	0	84	0	3	0	0	0	270	140	0	0	0
9	0	36	0	0.13	0	0	0	190	102	0	0	0
10	0	9.4	0	0	0	0	0	117	161	0	0	0
11	0	1.4	0	0	0	0	0	68	340	0	0	0
12	0	0.31	0	0	0	0	0	44	816	0	0	0
13	0	1.6	0	1.4	0	0	0	27	1370	0	0	0
14	0	1	0	13	0	0	0	14	1840	0	0	0
15	0	0.46	0.34	19	0	0	0	4.3	2090	0	0	0
16	0	0.29	7.9	22	0	0	0	29	2330	0	0	0
17	0	0.25	29	35	0	0	0	241	2720	0	0	0
18	0	0.36	52	40	0	0	0	358	3120	0	0	0
19	0	0.06	75	45	0	0	0	476	3720	0	0	0
20	0	0	80	30	0	0	0	662	4570	0	0	0
21	0	0	75	15	0	0	0	816	5130	0	0	0
22	0	0	70	3.8	0	0	0	862	4980	0	0	0
23	0	0	65	0.74	0	0	0	841	4090	0	0	0
24	0	0	60	0	0	0	0	835	2850	0	0	0
25	0	0	40	0	0	0	0	725	1740	0	0	0
26	0	0	11	0	0	0	0	624	1040	0	0	0
27	0	0	0.68	0	0	0	48	602	596	0	0	0
28	0	0	0	0	0	0	476	651	369	0	0	0
29	1.4	0	4.1	0	---	0	810	624	223	0	0	0
30	7.9	0	32	0	---	0	787	455	124	0	0	0
31	13	---	42	0	---	0	---	350	---	0	0	---
TOTAL	22.30	459.13	644.02	500.07	0.00	0.00	2121.00	14875.3	46103	80.10	0.00	0.00
MEAN	0.72	15.3	20.8	16.1	0	0	70.7	480	1537	2.58	0	0
AC-FT	44	911	1280	992	0	0	4210	29510	91450	159	0	0
MAX	13	96	80	45	0	0	810	879	5130	58	0	0
MIN	0	0	0	0	0	0	0	4.3	102	0	0	0
CAL YR	2009	TOTAL	24224.10	MEAN	66.4	MAX	1300	MIN	0	AC-FT	48050	
WTR YR	2010	TOTAL	64804.92	MEAN	178	MAX	5130	MIN	0	AC-FT	128500	

MAX DISCH: 5200 CFS AT 09:30 ON Jun. 21,2010 GH 8.71 FT. SHIFT 0.02 FT. (+0.04 FT GH CORR. APPLIED)

MAX GH: 8.71 FT. AT 09:30 ON Jun. 21,2010 (+0.04 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)
Water Year 2010

Location.-- Lat. 40°58'37", Long. 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.

Drainage and Period of Record.-- 23,821 mi². 1995 to current year.

Equipment.-- Sutron Constant Flow Bubbler (CFB) connected to a SatLink 2 Data Collection Platform DCP in a temporary NEMA enclosure. A wire weight gage located on the bridge is the primary reference for the gage, with a supplemental staff located on the bridge pier closest to the shelter. The staff reads 1.17 ft lower than the wire weight, which occasionally leads to confusion. On October 30, 2009, the Constant Flow Bubbler was replaced with a new CFB. The old CFB was not tracking well. The permanent gage shelter is a 4 ft by 6 ft prefabricated concrete building that was removed December 17, 2009 due to foundation issues. On that date, the temporary NEMA gage shelter and a new orifice line were installed.

Hydrologic Conditions.-- The South Platte channel at Julesburg is braided. Channel 1 is one of four channels, which can contain flow. The river is gaged on Channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg (PLAJUCCO). Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, 90-100% of the flow is in Channel 1, with Channels 2 and 3 being dry and some local irrigation and storm runoff in Channel 4. Channel 2 and Channel 3 will have water only at high flows. Generally the river is dried by multiple diversions upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). However, during the winter, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. Upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations.

Gage-Height Record.-- The primary record is hourly averages of 15-minute telemetered CFB data with DCP and CFB logs as backup. The record is complete and reliable, except for the following periods: October 1—December 17, due to CFB calibration problems. Problems were not corrected until a new orifice line was put in on December 17. October 1-November 22, 2009, there were numerous periods when GH was falsely high, and then corrected by a calibration. November 23-30: Record no good. Bubbler switched to unreliable old line on Nov 23. New bubbler unit on old line on Nov 30 recovers operation. December 1-17, 2009: Graphs showed many false troughs and spikes with likely some ice effect. December 24-27, January 6-7, 15, 19, February 9-11, 16, 22, bubbler was working but record was ice affected. May 6 and 17 had 2 and 5 hours of missing data, respectively. Missing hours were extrapolated with no loss of accuracy during periods of GH change with constant slope. July 14-20, low flow period when the new orifice line was above the water surface. Instrument calibration was supported by over 90 visits to the gage and 25 adjustments to the instrument. Distribution of adjustments within the record did not affect the quality of the record during any periods. This is discussed below: 12 Adjustments during the October 1-December 17 period, and 1 adjustment during the July 14-20 period were made on estimated record days. These corrections were incorporated into graphical estimates as seen on the GH plots. Adjustments were made on November 3, January 19 and June 22 by an inexperienced person during situations (changing flow and high flow) when the wire weight was hard to read. All adjustments were presumed to be in error since compensating adjustments were noted and made on the next visits by trained people. The remaining adjustments ranged from -0.06 to +0.05 ft and were distributed by time proration from point in time of last calibration verification to date of correction.

Datum Corrections.-- Levels were checked on May 6, 2010. Gage was found to read correctly. The wire weight was moved 30 feet north.

Rating.-- The control is shifting sand channel which has tended to scour with high flows and slowly fill back in. An island in the channel about 200 ft. downstream can collect trash/debris and affect the recorded stage values. Rating ONEJURCO06 was used for the 2009 record. A new rating was applied for the start of the 2010 record. Rating ONEJURCO07 was defined by measurements made in 2009 to 1150 cfs and confirmed by a 2220 cfs measurement made on April 29, 2010. ONEJURCO07 was used from October 1, 2009 until May 6, 2010. Between measurements made on April 29 and May 6, 2010, the channel scoured and a new stage-shift relationship evolved. A second new rating, ONEJURCO08 was developed and used from May 6 to the end of the water year. It is defined by measurements from 111 cfs to 4690 cfs. Thirty measurements (Nos. 602-631) were made by Colorado Division of Water Resources and Nebraska Department of Natural Resource (NDNR) personnel this water year. They ranged in discharge from 122 to 4690 cfs. The measurements cover the range experienced, except for June 21 (4720 cfs) and July 31-August 2 (120 cfs). The peak discharge of 4770 cfs occurred at 0545 June 21, 2010 at a gage height of 9.24 ft with a shift of 0.00 ft. It exceeded Measurement No. 620 on June 22, 2010 by 0.06 ft. and 80 cfs.

Discharge.-- Shifting is primarily caused by constant movement of sand in the channel and by scour from high flow events. Shifts were distributed by time proration with consideration of stage as follows. Oct. 1, 2009-April 29, 2010: Rating 7 in use, shifting by time using Msmt. No. 602-616. Msmts 608 and 609, made on the same day were discounted -3% and +3% to the same shift. April 29-May 6, 2010: shifting by time with consideration to stage using Msmts. 616-617. A large shift change (-0.07 ft to +0.42 ft) occurred as the channel scoured with high flows. The transition from Rating 7 to Rating 8 was made at 1500-1600 May 6. At 1500 May 6, +0.42 ft shift with Rating 7 at GH of 6.63 ft gives a discharge of 1990 cfs. At 1600 May 6, a -0.03 ft shift with Rating 8 at GH of 6.64 ft gives a discharge 2000 cfs. May 6—June 28, 2010: Rating 8 in use, shifting by time during high flow using Msmts. 617-621. Msmt 617 (-0.03 shift) was not adjusted to zero so that transition between tables was seamless. Measurements 618, 619, 621 were discounted up to 2% to the rating. High Msmt 620 was a zero shift on the new rating. June 28—July 8, 2010, flows diminishing, shifting by time with consideration to stage using Measurements 621 and 622 without adjustments. July 8-Sep. 30, 2010: shifting by time with consideration to stage using Msmts. 621-631 and No. 632 from WY 2011 without adjustments.

Special Computations.-- Discharge during bad or unreliable record was estimated on October 4-5, 7, 12-13, 19-20, November 1-2, 15-17, 21, 22. False peaks were determined by inspection of the GH graphs and visit data. True GH was estimated graphically by using adjacent good record and cutting off the peaks. Discharges were rounded with attention to adjacent record. During November 23-30, discharges were interpolated using visit GH's on 11/23, 11/24 and 11/30. During December 1-17, GH was estimated from visit readings and trends in the GH graphs and temperature trends. Discharge during the periods of ice affected record: December 24-27, January 6-7, 15, 19, February 9-11, 16, 22 were estimated from adjacent record and temperature trends. During July 14-20, GH was estimated from adjacent good record and discharges from diversions upstream.

Remarks.-- The record is good, except for the following periods: October 1 to November 20 is fair due to instrument problems, except for these days which were estimated and are poor: October 4-5, 7, 12-13, 19-20, November 1-2, 15-17. November 21-30, December 1-17 were estimated and poor due to instrument problems. The following days are estimated and fair due to ice affect: January 15, 19; February 9-11, 16, 22. The following days are estimated and poor due to ice affect: December 24-27, January 6-7. The following days were estimated and poor due to instrument problems: July 14-20. Station maintained and record developed by Devin Ridnour and Bob Cooper .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)

RATING TABLE--

ONEJURCO07 USED FROM 01-Oct-2009 TO 06-May-2010
ONEJURCO08 USED FROM 06-May-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

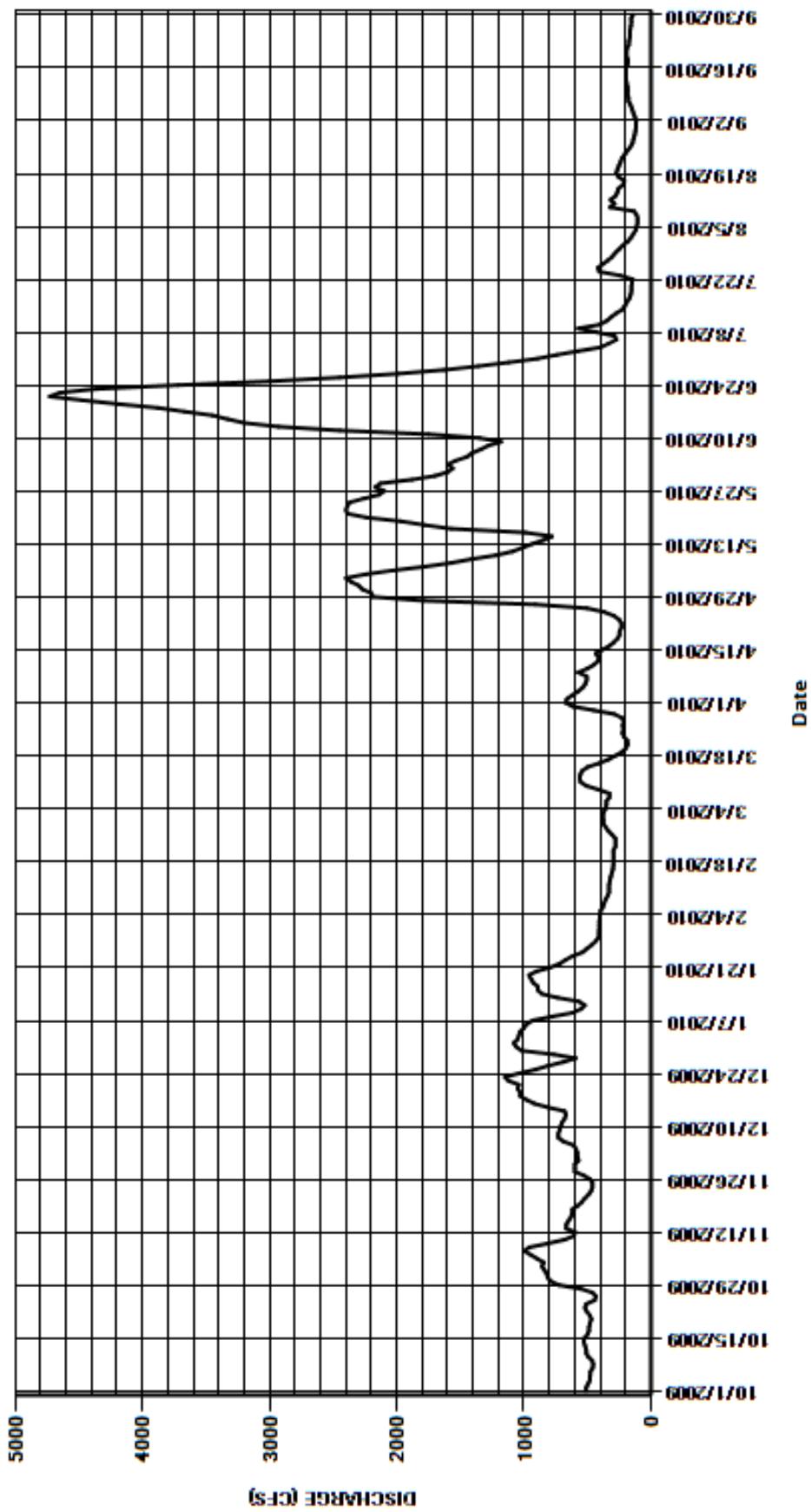
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	513	820	570	1080	408	375	672	2270	1600	894	182	120
2	509	840	580	1050	407	379	662	2300	1560	742	158	116
3	494	859	580	1040	404	375	619	2360	1600	574	139	129
4	480	844	590	1030	401	358	574	2400	1540	396	121	140
5	480	897	610	1000	397	351	538	2240	1450	333	111	149
6	479	947	690	980	379	351	517	2030	1410	273	107	160
7	460	997	730	930	368	327	506	1780	1340	287	106	176
8	455	958	730	780	358	327	507	1570	1280	428	114	177
9	462	811	720	619	340	410	574	1410	1180	572	133	186
10	493	682	710	552	330	507	503	1220	1350	403	324	182
11	510	606	700	521	330	554	451	1090	1750	348	288	187
12	510	598	680	568	330	562	418	1010	2450	314	319	194
13	520	669	670	736	324	557	408	935	2930	274	280	198
14	531	667	680	859	317	542	436	848	3200	225	265	196
15	523	650	810	890	309	499	384	779	3330	205	256	199
16	499	630	920	893	300	409	329	988	3450	190	218	198
17	487	620	980	928	297	335	292	1570	3670	170	210	183
18	487	620	1030	945	294	280	263	1780	3880	160	254	181
19	480	576	1030	960	294	227	247	1970	4190	155	274	192
20	470	543	1050	898	295	197	247	2240	4470	155	265	193
21	482	520	1040	793	296	183	232	2390	4730	151	253	191
22	506	490	1120	719	280	187	233	2400	4650	146	240	175
23	520	470	1150	673	281	213	252	2390	4360	245	230	174
24	509	460	1040	616	279	225	292	2370	3720	407	207	167
25	443	460	910	540	304	217	369	2260	3000	420	186	164
26	433	480	810	504	333	224	505	2140	2450	380	162	164
27	461	530	690	465	356	213	910	2100	1990	339	146	159
28	550	600	592	434	375	229	1790	2170	1630	304	139	155
29	724	600	765	412	---	288	2190	2130	1360	281	130	157
30	789	600	1020	409	---	451	2200	1880	1120	250	124	141
31	814	---	1060	409	---	614	---	1700	---	221	120	---
TOTAL	16073	20044	25257	23233	9386	10966	18120	56720	76640	10242	6061	5103
MEAN	518	668	815	749	335	354	604	1830	2555	330	196	170
AC-FT	31880	39760	50100	46080	18620	21750	35940	112500	152000	20320	12020	10120
MAX	814	997	1150	1080	408	614	2200	2400	4730	894	324	199
MIN	433	460	570	409	279	183	232	779	1120	146	106	116
CAL YR	2009	TOTAL	177039	MEAN	485	MAX	2480	MIN	41	AC-FT	351200	
WTR YR	2010	TOTAL	277845	MEAN	761	MAX	4730	MIN	106	AC-FT	551100	

MAX DISCH: 4770 CFS AT 05:45 ON Jun. 21,2010 GH 9.24 FT. SHIFT 0 FT.

MAX GH: 9.24 FT. AT 05:45 ON Jun. 21,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)
Water Year 2010

Location.--	Lat. 40°58'46", Long. 102°15'15", in NW 1/4 NE 1/4 sec. 33, T.12 N., R.44 W., Sedgwick County, Hydrologic Unit 10190018, on left bank of channel No 4 (left channel) 215 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage and Period of Record.--	23,821 mi ² .
Equipment.--	Metal pipe shelter and well. Supplemental outside chain gage. No recording equipment. An SDR datalogger/shaft encoder is being stored for this location and can be installed if conditions warrant.
Hydrologic Conditions.--	Channel 4, the furthest channel to the North, splits off Channel 2 somewhere upstream from the point where Channel 1 splits from Channel 2. During the drought years 2000-2004, Channel 4 filled with vegetation and became swampy and ponded. Stream gaging of channel 4 was abandoned beginning in water year 2008. When river upstream reaches around 2000 cfs, some water begins to be dumped into the channel; but there is not enough of a stage-discharge relationship for a gage to work. It is difficult to find sections where measurement might be possible. Any river water measured in Channel 4 is included in the measurement for Channel 2. The State of Colorado is obliged to keep a record of flow in this channel for the South Platte River Compact with Nebraska. Presently at Compact level (120 cfs), no flow from the main river is in Channel 4-- but some base flow exists from seepage and local runoff sources. The record at Channel 4 estimates these base flows. These base flows are usually insignificant to the total river at high flows, but can become a significant percentage of the total in a dry summer. As above, any real river water which spills in to the channel during high water is included by measurement in the Channel 2 record. These non-measurable base flows are estimated by combining two administrative records—The Town of Julesburg Return ditch and the Julesburg Sewer plant discharge. The Town return ditch contains much—but not all—of the local runoff, occasional irrigation return flows, and some well augmentation water. It is active during the irrigation season, but is dry in the winter months except for an occasional day or two of storm runoff.
Gage-Height Record.--	Not applicable. Record is always estimated.
Datum Corrections.--	N/A.
Rating.--	N/A.
Discharge.--	Measurements made on Channel 4 are no longer used for record purposes. Discharge was estimated for the entire year in the following manner. Administrative record from the Town of Julesburg Return Ditch weir was added to the flows recorded for the Julesburg Sewer Plant effluent. Both these have measurement devices and logged data and can be considered fair data. However, they would not be a good representation of the flow at the Channel 4 gage in rainy weather. During storm runoff the Town Return Ditch contains the "flashiest" portion of local runoff to the gage, being only about 700 ft away. Other local runoff gets dispersed by the weeds and ponding and filters down more slowly. But it is fair to say that when there is runoff in the Return Ditch, there is likely other water that is not measurable. So the estimates being made for base flow in Channel 4 are likely low and need to be considered as poor.
Special Computations.--	A spreadsheet was used to add the flows from the Sewer Plant and the Return Ditch. The sewer plant report is slightly confusing in that it will list daily cfs figures, but the monthly total cfs shown is not precisely the sum of the daily flows. This is presumably due to rounding of the meter readings. This record is put in a spreadsheet with Channel 1 and 2 discharge record to compute daily combined flow.
Remarks.--	The record is estimated and poor. The gage is no longer operated due to ponding and the lack of a stage-discharge relationship. Record contains estimates for unmeasurable base flows from local sources. This record is added to the records from Channels 1 and 2 to form the record for South Platte River at Julesburg, Combined flow. Record developed by Devin Ridnour.
Recommendations.--	The Channel 4 gage could be reestablished (for a while) if extensive machine work cleared the channel of vegetation. A bubbler instrument would be needed as a stilling well has never worked well at this location due to the mud.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

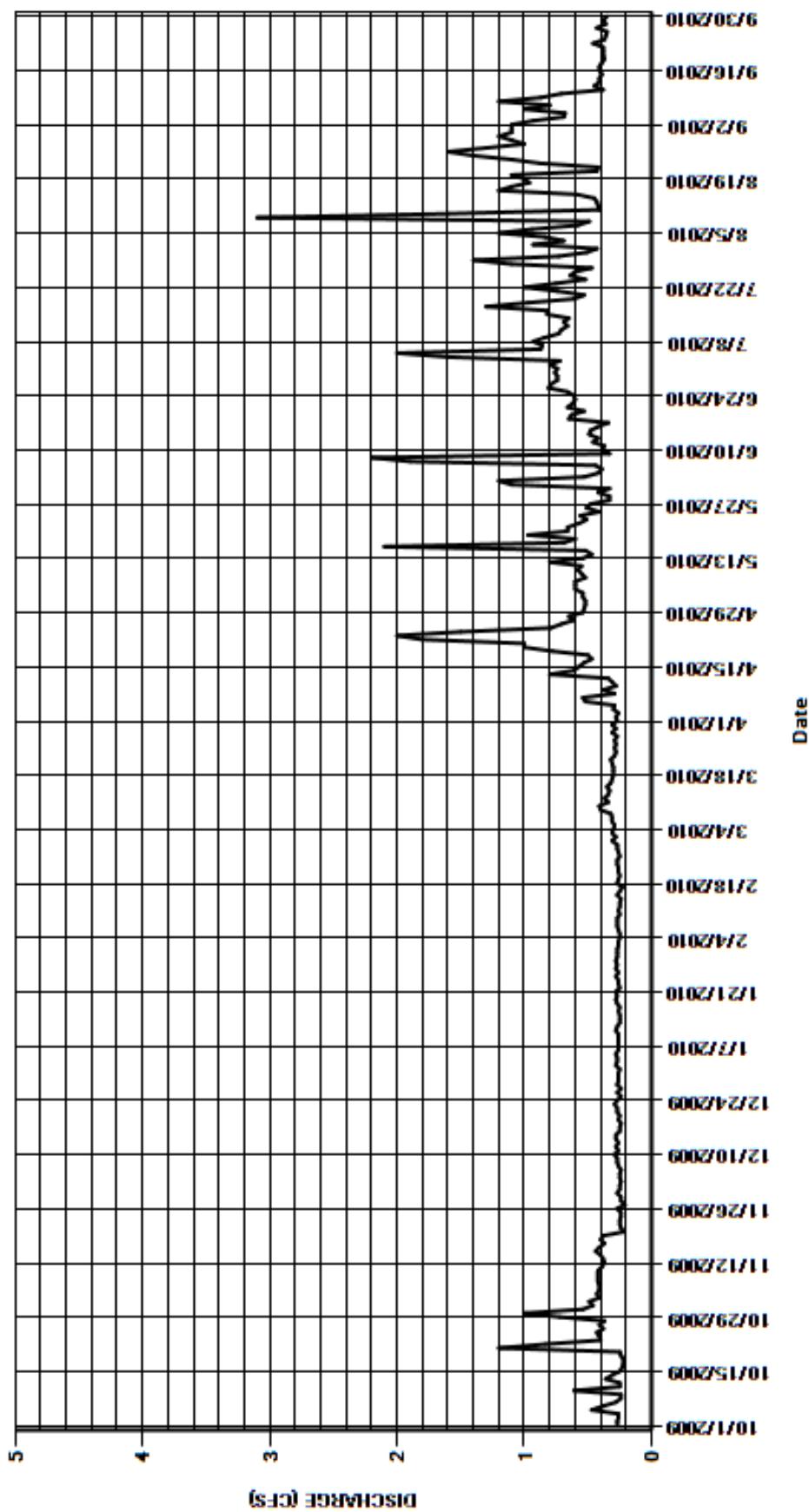
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.27	0.46	0.25	0.25	0.27	0.31	0.27	0.52	1.1	0.74	0.43	1.1
2	0.27	0.49	0.25	0.28	0.26	0.28	0.28	0.52	1.2	0.8	0.93	1.1
3	0.26	0.41	0.24	0.27	0.26	0.31	0.26	0.54	0.53	0.72	0.69	0.93
4	0.26	0.43	0.25	0.27	0.25	0.3	0.3	0.54	0.42	1.6	0.84	0.69
5	0.47	0.41	0.25	0.28	0.25	0.29	0.29	0.6	0.39	2	1.2	0.68
6	0.38	0.41	0.24	0.26	0.26	0.31	0.52	0.6	0.44	0.87	0.94	1
7	0.28	0.42	0.26	0.26	0.27	0.31	0.54	0.6	1.9	0.86	0.58	0.8
8	0.24	0.42	0.27	0.26	0.27	0.32	0.29	0.52	2.2	0.93	0.49	1.2
9	0.24	0.42	0.27	0.26	0.27	0.4	0.38	0.55	0.33	0.84	3.1	0.87
10	0.61	0.42	0.29	0.26	0.25	0.41	0.28	0.58	0.39	0.73	1.6	0.71
11	0.25	0.39	0.26	0.28	0.26	0.34	0.31	0.55	0.37	0.71	0.41	0.38
12	0.25	0.37	0.28	0.27	0.25	0.37	0.34	0.8	0.46	0.66	0.42	0.45
13	0.36	0.38	0.26	0.25	0.25	0.34	0.8	0.54	0.42	0.69	0.43	0.41
14	0.31	0.4	0.28	0.25	0.24	0.33	0.61	0.47	0.49	0.65	0.45	0.41
15	0.25	0.44	0.28	0.25	0.27	0.35	0.57	0.52	0.48	0.82	0.59	0.39
16	0.23	0.41	0.25	0.26	0.25	0.32	0.53	2.1	0.42	0.82	1.2	0.41
17	0.22	0.37	0.25	0.25	0.23	0.31	0.47	0.69	0.34	1.3	1.1	0.41
18	0.22	0.4	0.24	0.27	0.27	0.3	0.5	0.6	0.65	0.97	0.96	0.39
19	0.24	0.38	0.26	0.28	0.26	0.3	0.78	0.97	0.63	0.61	1	0.37
20	0.25	0.22	0.25	0.27	0.25	0.3	1	0.66	0.53	0.53	1.1	0.38
21	1.2	0.24	0.27	0.28	0.26	0.31	1	0.66	0.66	0.74	0.43	0.38
22	0.83	0.25	0.27	0.25	0.26	0.32	1.8	0.57	0.62	1	0.42	0.38
23	0.4	0.25	0.29	0.26	0.27	0.29	2	0.51	0.6	0.75	0.87	0.46
24	0.41	0.24	0.27	0.26	0.27	0.28	1.5	0.56	0.61	0.52	1.1	0.37
25	0.43	0.24	0.24	0.28	0.25	0.29	0.79	0.41	0.66	0.64	1.4	0.36
26	0.38	0.27	0.27	0.26	0.26	0.28	0.71	0.51	0.81	0.6	1.6	0.35
27	0.41	0.21	0.24	0.28	0.27	0.29	0.61	0.48	0.79	0.47	1.3	0.43
28	0.37	0.24	0.27	0.27	0.27	0.27	0.65	0.33	0.74	1.1	1	0.36
29	0.72	0.24	0.26	0.28	---	0.31	0.54	0.33	0.74	1.4	1.1	0.38
30	1	0.27	0.26	0.27	---	0.28	0.53	0.42	0.76	0.73	1.2	0.35
31	0.54	---	0.26	0.27	---	0.31	---	0.33	---	0.51	1.1	---
TOTAL	12.55	10.50	8.08	8.24	7.25	9.73	19.45	18.58	20.68	26.31	29.98	16.90
MEAN	0.4	0.35	0.26	0.27	0.26	0.31	0.65	0.6	0.69	0.85	0.97	0.56
AC-FT	25	21	16	16	14	19	39	37	41	52	59	34
MAX	1.2	0.49	0.29	0.28	0.27	0.41	2	2.1	2.2	2	3.1	1.2
MIN	0.22	0.21	0.24	0.25	0.23	0.27	0.26	0.33	0.33	0.47	0.41	0.35
CAL YR	2009	TOTAL	208.52	MEAN	0.57	MAX	8.5	MIN	0.17	AC-FT	414	
WTR YR	2010	TOTAL	188.25	MEAN	0.52	MAX	3.1	MIN	0.21	AC-FT	373	

MAX DISCH: NOT DETERMINED

MAX GH: FT. NOT DETERMINED

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)
Water Year 2010

Location.-- Lat 40°58'37", long 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.

Drainage and Period of Record.-- 23,821 mi². Apr. 1902 to present. Monthly discharge for some periods published in USGS WSP 1310.

Equipment.-- Combined record is from South Platte River at Julesburg Channel 2, Channel 1, and Channel 4 records. See individual records for these channels for descriptions of gage equipment.

Hydrologic Conditions.-- In 2010, water began flowing in Channel 2 when flow in Channel 1 exceeded about 700 cfs. Computed flows in the two channels were equal at around 4000 cfs. At peak, more water was computed for Channel 2, but this computed figure included water flowing in Channels 3 and 4. All flow from points upstream was computed in Channels 1 and 2. In 2010, there was live flow in Channel 4 during periods when the river was high. This flow was measured as part of Channel 2, and thus contributed to the measurements used to develop the new Channel 2 rating. The Channel 4 gage was abandoned in 2006 due to swampy conditions, but a 'paper' record is maintained so that flows from two very small tributaries can be included in the total record for Interstate Compact purposes. Administrative data for the Town of Julesburg sewer plant, and the Town of Julesburg Return Ditch are added together to create this Channel 4 record.

Gage-Height Record.-- See individual records for analyses of gage height record.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- **DAILY FLOWS:** Combined daily flows are computed by inserting the mean daily flows for Channels 1, 2 and 4 into a spreadsheet and adding the totals day-by-day. The record spreadsheet was then used to generate the standard file of combined daily flows and the annual summary. **PEAK DISCHARGE:** Peak discharge occurs as a Combined Flow and this combined flow peak may or may not correspond to the peak discharges on the individual channel records. At present the CDWR records program is based on hourly computation of discharge. Finding the peak for the 15-minute data at a gage with multiple records requires a special procedure. Normally, the day of peak discharge can be determined from inspection of hydrograph. If flow is contained in Channel One, then the Channel One peak can be used. When flow is being recorded in multiple channels, then hourly discharges for the peak flow period need to be entered in a spreadsheet for Channels 1 and 2. Then an hourly combined peak discharge is determined by inspection. 15-minute data within the peak hour is collated and discharges are hand-computed and entered on a spreadsheet. The 15-minute peak is then determined by inspection. Daily flow estimated to have been in Channel 4 on the peak day is added to the combination of 1 and 2. The peak is listed using Channel 1 GH, but without a shift. The above procedure was carried out in a spreadsheet and the peak flow was 9970 cfs at 1000 June 21, 2010 at a Channel 1 gage height of 9.24 ft. **MAXIMUM GH:** This is determined from Channel 1. Due to shift distributions, this may not be the Channel 1 GH corresponding to combined flow peak discharge. In 2010, the maximum Channel 1 GH occurred at 0545 June 21, 2010 with a value of 9.24 ft. **ESTIMATED DAYS:** If an estimate for either Channel 1, 2 or 4 contributes more than 10% of the total flow for a particular day, then the combined flow is considered estimated for that day. Estimated days for each channel are flagged in the combined flow calculation spreadsheet. Days with more than 10% of the total being estimates were determined by inspection. In 2010, the following days were determined to be estimated and poor due to estimates made on Channel 1: October 4-5, 7, 12-13, 19-20, November 1-2, 15-17, 21-30, December 1-17, 24-27, January 6-7, July 14-20. The following days were rated fair in Channel 1 and are fair in the combined flow record: October 1 to November 20, January 15, 19 February 9-11, 16, 22. The following days were determined to be estimated and poor due to estimates made on Channel 2: May 6-9, 2010. In 2010, estimates on Channel 1 and 2 were based on partial record, visit readings, and measurements.

Special Computations.-- A number of special calculations may be needed each year. Spreadsheets to compute combined flow and flag estimated days (always used.) A peak discharge calculation spreadsheet, as discussed above (used in 2010). Winter estimates using mass balances involving our upstream gage at Balzac (not required for 2010). Winter hydrographs using trends from a downstream gage—South Platte River at Roscoe, Nebraska (not required in 2010).

Remarks.-- The combined flow record is good, except October 4-5, 7, 12-13, 19-20, November 1-2, 15-17, 21-30, December 1-17, 24-27, 2009, January 6-7, May 6-9, and July 14-20, 2010 are estimated and poor; and, October 1 to November 20, 2009, January 15, 19, February 9-11, 16, 22, 2010 are fair, either because the Channel 1 record was fair, or one of the other channels had a significant estimated flow. In 2010, about 81% of the combined flow was in Channel 1, 19% was in Channel 2, and 0.02% was in Channel 4. Record developed by Devin Ridhour and Bob Cooper.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	513	836	570	1130	408	375	672	3080	1890	953	182	121
2	509	864	580	1090	407	379	662	3140	1830	762	159	117
3	494	894	580	1080	404	375	619	3240	1880	578	140	130
4	480	876	590	1070	401	358	574	3280	1790	398	122	141
5	480	946	610	1040	397	351	538	2930	1660	335	112	150
6	479	1020	690	1020	379	351	518	2540	1600	274	108	161
7	460	1090	730	955	368	327	507	2160	1500	288	107	177
8	455	1040	730	783	358	327	507	1840	1420	429	114	178
9	462	847	720	619	340	410	574	1600	1280	573	136	187
10	494	692	710	552	330	507	503	1340	1510	404	326	183
11	510	608	700	521	330	554	451	1160	2090	349	288	187
12	510	599	680	568	330	562	418	1050	3270	315	319	194
13	520	671	670	738	324	557	409	963	4300	275	280	198
14	531	668	680	872	317	542	437	862	5040	226	265	196
15	523	651	811	909	309	499	385	784	5420	206	257	199
16	499	631	928	915	300	409	330	1020	5780	191	219	198
17	487	621	1010	963	297	335	292	1810	6390	171	211	183
18	487	621	1080	985	294	280	264	2140	7000	161	255	181
19	480	576	1110	1010	294	227	248	2450	7910	156	275	192
20	470	543	1130	928	295	197	248	2900	9040	156	266	193
21	483	520	1120	808	296	183	233	3210	9860	152	253	191
22	507	490	1190	723	280	187	235	3260	9630	147	240	175
23	520	470	1220	674	281	213	254	3230	8450	246	231	174
24	509	460	1100	616	279	225	294	3210	6570	408	208	167
25	443	460	950	540	304	217	370	2990	4740	421	187	164
26	433	480	821	504	333	224	506	2760	3490	381	164	164
27	461	530	691	465	356	213	959	2700	2590	339	147	159
28	550	600	592	434	375	229	2270	2820	2000	305	140	155
29	726	600	769	412	---	288	3000	2750	1580	282	131	157
30	798	600	1050	409	---	451	2990	2340	1240	251	125	141
31	828	---	1100	409	---	614	---	2050	---	222	121	---
TOTAL	16101	20504	25912	23742	9386	10966	20267	71609	122750	10354	6088	5113
MEAN	519	683	836	766	335	354	676	2310	4092	334	196	170
AC-FT	31940	40670	51400	47090	18620	21750	40200	142000	243500	20540	12080	10140
MAX	828	1090	1220	1130	408	614	3000	3280	9860	953	326	199
MIN	433	460	570	409	279	183	233	784	1240	147	107	117

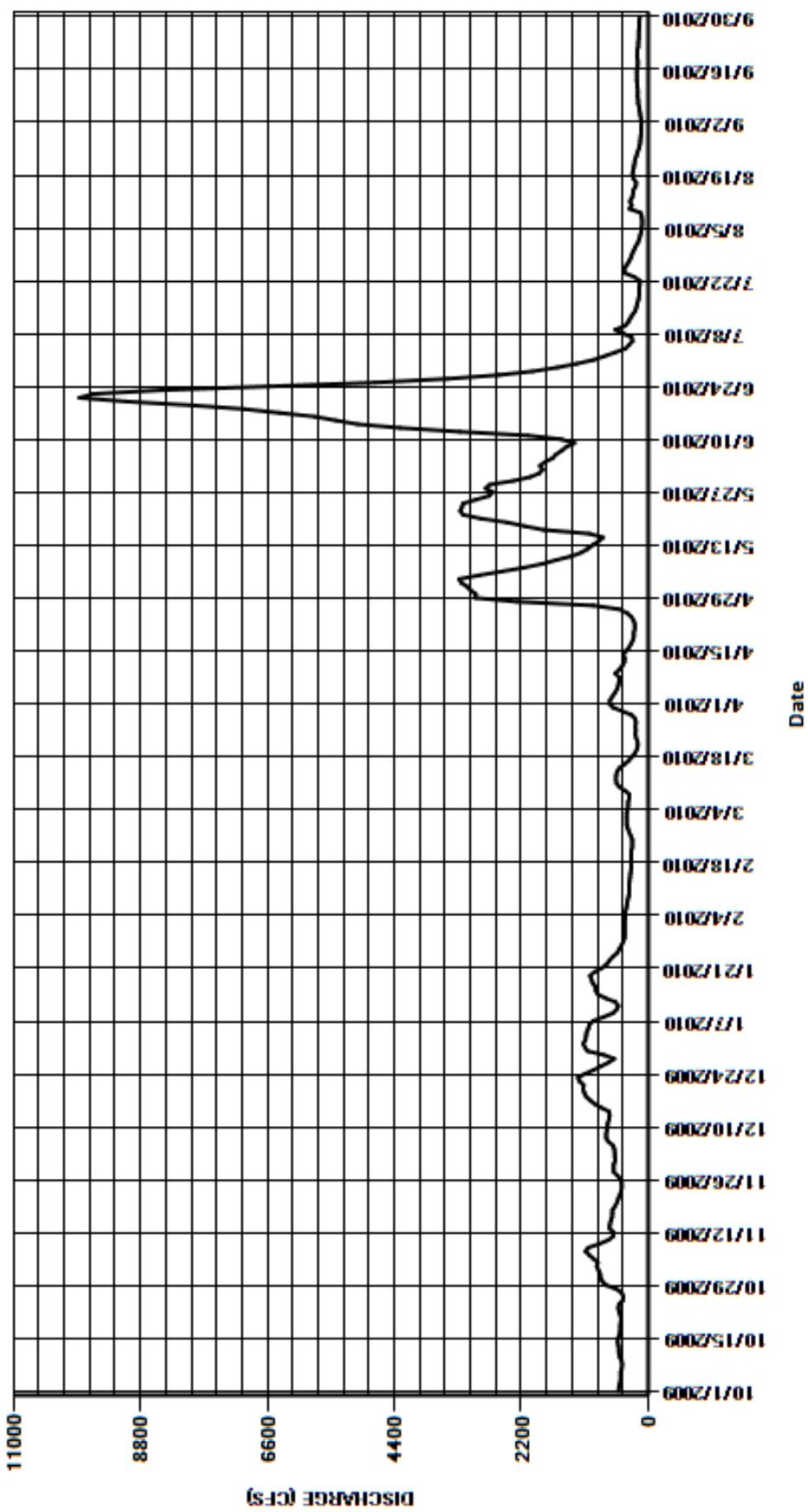
CAL YR	2009	TOTAL	201458	MEAN	552	MAX	3730	MIN	41	AC-FT	399600
WTR YR	2010	TOTAL	342792	MEAN	939	MAX	9860	MIN	107	AC-FT	679900

MAX DISCH: 9970 CFS AT 10:00 ON Jun. 21,2010 GH 9.24 FT. SHIFT 0 FT.

MAX GH: 9.24 FT. AT 05:45 ON Jun. 21,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
STATELINE DITCH AUG. RETURN TO SOUTH PLATTE
Water Year 2010

Location.--	Lat 40°59'58", long 102°14'55", in NW1/4 NW1/4 of sec 27, T. 12N, R. 44W, Yuma County, East of Julesburg, Co. Gage is about 700 ft. north of US Highway 138 on Yuma County Road 43 near the Colorado-Nebraska Stateline.
Drainage and Period of Record.--	Not determined; Data from 2001 in DWR diversion records, published by Hydrographic Branch since 2007.
Equipment.--	Sutron SDR shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in metal box enclosure and well section at a 4-foot Parshall flume. The flume is installed in a concrete canal section and is referenced with an outside staff. The high data rate DCP is mounted on poles next to the recorder enclosure.
Hydrologic Conditions.--	Controlled diversion from Julesburg Irrigation District Flow is derived from wells that pump directly into the ditch for delivery to the river as augmentation credit.
Gage-Height Record.--	The primary record is hourly averages of 15-minute SDR data. The record is complete and reliable, except for the following: September 28 was missing 8 hours of data. The missing hours were interpolated from adjacent good record. The ditch turned off frequently, and many corrections were made to set the SDR to zero when the float was actually on mud and above zero datum. This was done by the ditchrider at the request of the water commissioner so that real time data was accurate. When live flow resumed, the GH was re-set to live flow by the ditchrider within an hour or two. Also, flows may have been present below the level where the float was beached, but these periods are considered zero for water rights administration purposes. (Credit is not given when record is not maintained.) These periods of zero flow were determined by observation and by inspection of the GH graphs. Many small GH calibrations were made during live flow that showed a + and – alternation characteristic of plugged inlets, and were thus suspect. The corrections were not large enough to affect the accuracy of the record. To fully comply with record procedures, every time the GH was adjusted, a datum correction was used. This meant sixty datum corrections were applied, using water commissioner visits and the SDR event log to guide the proration. The SDR event log was required for this since the Julesburg Irrigation District ditch rider did not record visit information when he set the recorder down to zero when the float was beached, and then corrected it back up when flow started. Corrections this year generally only applied to live flow for a few hours at each start-up time and did not adversely affect the record quality. In 2011, datum corrections will only be used during periods of live flow at this gage.
Datum Corrections.--	Levels run on Sept 1, 2010. No correction was required to the primary reference.
Rating.--	Control is a 4-foot steel Parshall Flume in earth channel. A standard 4- foot Parshall Flume rating was used again this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/- 5% accuracy range. There were no days with many hourly flows outside the range in WY 2010. Two measurements were made during the year ranging in discharge from 6.54 to 13.7 cfs. The peak flow of 24.6 cfs occurred at 0645 July 10, 2010 at a gage height of 1.37 ft (gage height correction of +0.02 ft applied) with a shift of -0.07 ft. The peak was within the accurate measurement range of the flume.
Discharge.--	Shifting control method was used. Shifts were distributed by time proration. Shifts are caused by flume geometry and approach conditions. Measurement 4 had a shift of -0.07 ft and Measurement 5 had a shift of -0.06 ft. Both measurements were given full weight. Measurement 3 made in 2009 was also given full weight in the distribution.
Special Computations.--	Many periods of zero flow were computed as zero using the rating, bad (mud) GH's, and datum corrections derived from the SDR log. In the future these periods will be manually entered as zero.
Remarks.--	The record is considered good except for the following days are estimated and poor due to missing data: September 28, 2010. Many hours of record were considered zero for purposes of water rights administration because mud in the stilling well prevented readings. Station maintained and record developed by Devin Ridnour.
Recommendations.--	A number of things need to be done to bring this record up to publication standards: when the GH is adjusted during periods of live flow, a rod should be run through the inlet first to verify that the inlets do not have mud in them. The well needs to be inspected often to verify floats are not beaching at gage heights greater than zero. The ditch-rider needs to write on the paper visit sheet to be kept at the gage to record visits and adjustments made. If measurements are made by State of Nebraska personnel, a copy of the measurement should be obtained and recorded.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

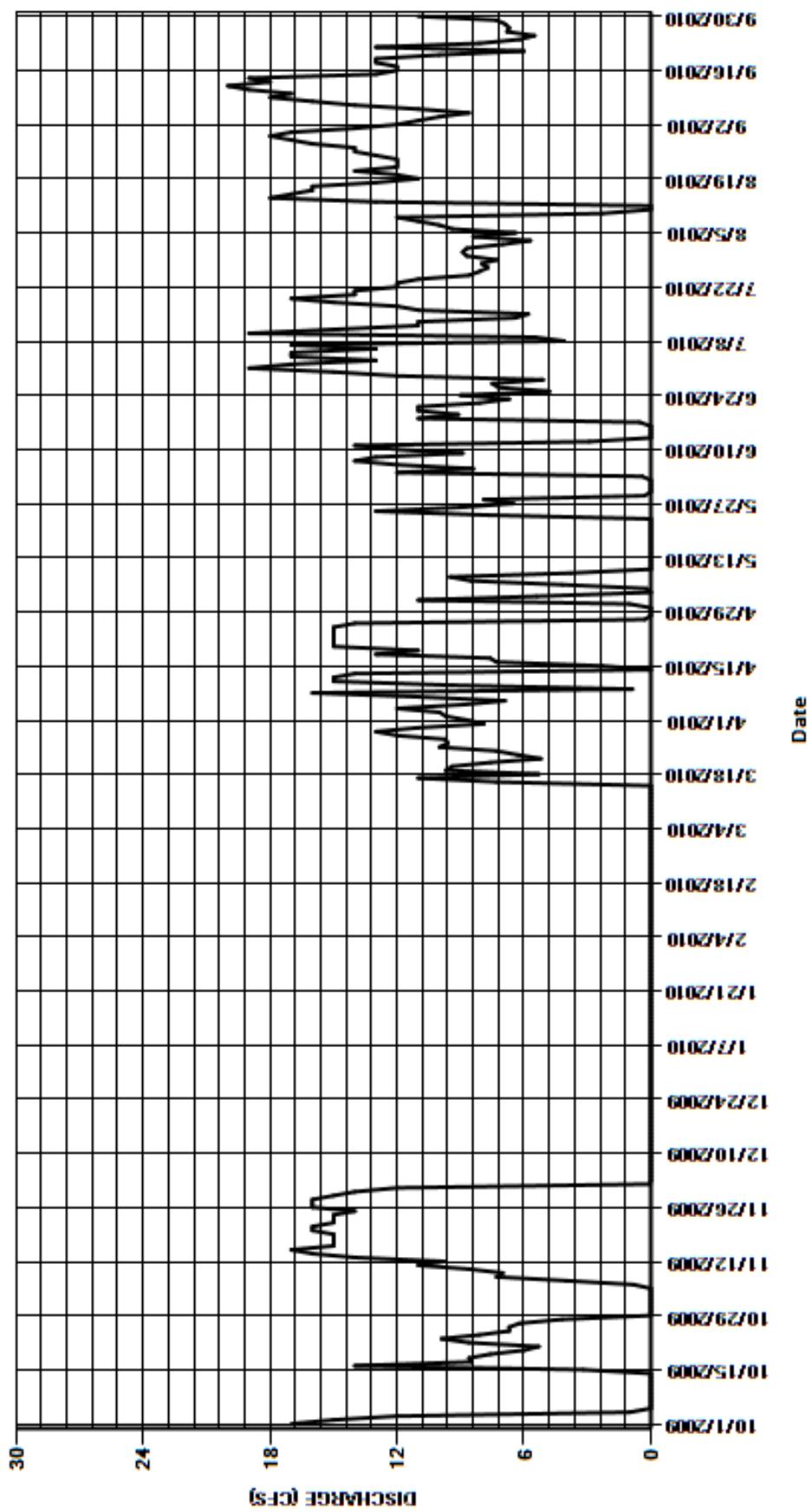
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	0	12	0	0	0	8.7	1	0	19	8.7	14
2	15	0	0.04	0	0	0	9.7	11	0	17	7	12
3	12	0	0	0	0	0	10	5.4	0.41	13	5.7	11
4	1	0	0	0	0	0	12	0	12	17	8.4	10
5	0	0	0	0	0	0	8.8	0.22	8.4	17	6.4	8.6
6	0	0.82	0	0	0	0	6.9	4.2	12	13	9.4	11
7	0	4	0	0	0	0	11	8.5	14	17	10	14
8	0	7.3	0	0	0	0	16	9.5	13	4.1	11	16
9	0	7	0	0	0	0	0.87	3.8	8.9	5.5	12	18
10	0	8.6	0	0	0	0	9.4	0	12	19	2.3	17
11	0	11	0	0	0	0	15	0	14	15	0	19
12	0	9.8	0	0	0	0	15	0	2.9	11	0	20
13	0	14	0	0	0	0	14	0	0	11	13	18
14	0	16	0	0	0	0	0	0	0	6.4	18	19
15	3.2	17	0	0	0	0	2.3	0	0	5.8	17	13
16	14	15	0	0	0	7.3	7.3	0	0	11	16	12
17	8.5	15	0	0	0	11	7.6	0	0.53	12	16	12
18	8.6	15	0	0	0	5.3	13	0	11	15	13	13
19	7.6	15	0	0	0	9.7	11	0	9.1	17	11	13
20	6	16	0	0	0	9.4	15	0	11	14	12	10
21	5.3	16	0	0	0	7.6	15	0	11	14	14	6
22	8.6	15	0	0	0	5.2	15	0	8.1	12	12	13
23	9.9	15	0	0	0	6.3	15	0	6.7	12	12	8.1
24	8.1	15	0	0	0	7.3	15	7.7	9	11	12	6.2
25	6.7	14	0	0	0	10	15	13	4.8	8.6	13	5.5
26	6.7	16	0	0	0	9.6	14	9	7.2	8.1	14	6.8
27	6.2	16	0	0	0	9.7	0.29	6.5	7.5	7.7	14	6.7
28	4.2	16	0	0	0	12	0	7.9	5.1	8	16	6.9
29	0	15	0	0	---	13	0	0.3	12	7.3	17	7.3
30	0	14	0	0	---	11	0	0	15	8.7	18	11
31	0	---	0	0	---	7.9	---	0	---	8.9	17	---
TOTAL	148.60	323.52	12.04	0.00	0.00	142.30	282.86	88.02	215.64	366.1	355.90	358.1
MEAN	4.79	10.8	0.39	0	0	4.59	9.43	2.84	7.19	11.8	11.5	11.9
AC-FT	295	642	24	0	0	282	561	175	428	726	706	710
MAX	17	17	12	0	0	13	16	13	15	19	18	20
MIN	0	0	0	0	0	0	0	0	0	4.1	0	5.5

CAL YR	2009	TOTAL	1824.28	MEAN	5	MAX	20	MIN	0	AC-FT	3620
WTR YR	2010	TOTAL	2293.08	MEAN	6.28	MAX	20	MIN	0	AC-FT	4550

MAX DISCH: 24.2 CFS AT 06:45 ON Jul. 10,2010 GH 1.37 FT. SHIFT -0.07 FT. (+0.02 FT GH CORR. APPLIED)
MAX GH: 1.37 FT. AT 06:45 ON Jul. 10,2010 (+0.02 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE
WY2010 HYDROGRAPH



TRANSMOUNTAIN DIVERSIONS INTO THE SOUTH PLATTE BASIN IN COLORADO, WY 2010
WATER YEAR 2010 (October 2009 - September 2010)

FROM THE COLORADO RIVER BASIN

NAME	2009			2010									
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Adams Tunnel*	16359	856	8899	13491	12635	14172	12127	2560	1376	9824	7791	13749	113,839
Berthoud Pass Ditch	0	0	0	0	0	0	0	0	116	110	36.8	6.35	269
Boreas Pass Ditch	0	0	0	0	0	0	0	0	39.7	12.7	0	0	52
Grand River Ditch	61.0	0	0	0	0	0	0	306	3800	2270	522	116	7,075
A.P. Gumlick Tunnel**	0	0	0	0	0	0	0	0	57.6	0	0	0	58
Moffat Tunnel	1810	790	399	337	241	238	659	4778	900	2582	1341	1571	15,646
Roberts Tunnel	2130	834	0	0	0	331	1307	0	2266	6216	5351	8931	27,366
Straight Creek Tunnel	4.48	3.65	3.29	3.13	2.51	2.63	3.64	9.26	41.2	17.1	11.4	7.57	110
Vidler Tunnel	0	0	0	0	0	0	0	25.4	239.8	85.8	130	0	481
TOTALS FROM THE COLORADO RIVER BASIN (DAY-CFS)													164,895
TOTALS FROM THE COLORADO RIVER BASIN (ACRE-FT)													327,070

TOTALS FROM THE COLORADO RIVER BASIN (DAY-CFS)

164,895

TOTALS FROM THE COLORADO RIVER BASIN (ACRE-FT))

327,070

*West slope water only

**Direct release to Clear Creek only. All other flow included in Moffat Tunnel

FROM THE LARAMIE RIVER BASIN

NAME	2009			2010									
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Bob Creek Ditch	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbine Ditch	0	0	0	0	0	0	0	0	0	0	0	0	0
Deadman Ditch	0	0	0	0	0	0	0	0	51.9	91.0	17.3	0	160
Laramie-Poudre Tunnel	167	0	0	0	0	0	0	0	1119	2701	1137	288	5,412
Skyline Ditch	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS FOR THE LARAMIE RIVER (DAY-CFS)	WY2010											5,572	
TOTALS FOR THE LARAMIE RIVER	(AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement)											WY2010	
TOTALS FOR THE LARAMIE RIVER	(AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement)											CY2010	
	2009			2010									
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Wilson Supply Ditch (Gage)	0	0	0	0	0	0	0	214	310	140	12.3	0	676
minus Deadman Ditch	0	0	0	0	0	0	0	0	51.90	91.0	17.3	0	160
= SAND CR. DIVERSION***	0	0	0	0	0	0	0	214	258	48.9	-5.04	0	515
*** Negative Numbers due to Deadman Ditch Losses													
TOTALS FROM THE LARAMIE RIVER BASIN (DAY-CFS)												6,088	
TOTALS FROM THE LARAMIE RIVER BASIN (ACRE-FT)												12,075	

*** Negative Numbers due to Deadman Ditch Losses

TOTALS FROM THE LARAMIE RIVER BASIN (DAY-CFS)

6.088

TOTALS FROM THE LARAMIE RIVER BASIN (ACRE-FT)

12 075

FROM THE NORTH PLATTE RIVER BASIN

TOTALS FROM THE NORTH PLATTE RIVER BASIN (DAY GES)

1 832

TOTALS FROM THE NORTH PLATTE RIVER BASIN (DAY-CFS)
TOTALS FROM THE NORTH PLATTE RIVER BASIN (ACRE FT)

1,832

SPECIAL CATEGORIES

NAME	2009			2010									
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Hoosier Pass Tunnel *	536	456	0	0	0	0	63.3	631	1600	1011	683	94.1	5,075
Aurora Homestake Pipeline**	1178	615	1139	1245	1130	1445	1081	1305	114	0.00	2170	0.00	11,422

* Diverts into Division One, but entire flow is piped to the City of Colorado Springs in Division 2.

** Contains a Mixture of Colorado River Water and Water Transferred from the Arkansas River

PLATTE RIVER BASIN
AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
Water Year 2010

Location.--	Lat. 38°56'53", Long. 105°41'02", in Park County above Spinney Mountain Reservoir.
Drainage and Period of Record.--	1998 to present.
Equipment.--	Two 30.00-in by 21.00-in venturi meters in a pipeline upstream of two sleeve type (Bailey) control valves with open discharge. The two venturi meters are monitored by a satellite monitoring data collection platform (DCP). The DCP, venturi meters and facilities are owned and maintained by the City of Aurora. There are two meters; one is on the main discharge valve to Spinney Reservoir (Discharge No. 1), and the other discharge valve (Discharge No. 2) functions as a pressure-relief valve for the pipeline. Both releases are monitored by the DCP and by the combined Aurora and City of Colorado Springs Supervisory Control and Data Acquisition (SCADA) system.
Hydrologic Conditions.--	Flow is comprised of transmountain water imported from a number of sources in the Colorado River Basin, Colorado River water stored on the Eastern slope from previous years, and native Arkansas River water transferred from points downstream. All flow is diverted to Twin Lakes Reservoir and transported in the Homestake pipeline to the Otero Pump Station. The pipeline delivers water to Aurora at Spinney Mountain Reservoir and continues to the City of Colorado Spring's Rampart Reservoir. Colorado River water is included in deliveries of Homestake Tunnel, Busk-Ivanhoe Tunnel and Twin-Lakes Tunnel. In general the total flow at this gage represents approximately 45% Colorado River Water, and 55% Arkansas basin water. Water deliveries are ordered to Spinney Reservoir through the main discharge (Discharge No.1). Spikes of water from the pressure relief valve (Discharge No. 2) are usually small and infrequent. This water drains into Spinney and its accrual is accidental and can occur when water is not delivered through the main discharge valve.
Gage-Height Record.--	The primary record is two sets of hourly averages of 15 minute satellite data with SCADA system data used as back up. The record is complete and reliable. When DCP data was not available or reliable, values from the combined Aurora and City of SCADA system accounting was used. The SCADA system prints the daily report at 12:01 am for the previous day. The SCADA system reports Discharge 1 as "Aurora Flow" and Discharge 2 as "Relief Flow". Missing data due to power interruptions or DCP failures was replaced by SCADA system data on the following days: Discharge 1: January 23, 2010 – 7 hours , May 1-13, 2010 – 13 days. Zero flow, no discharge during this period. May 14, 2010 – 15:00, 1 hour. Discharge 2 (Relief Valve): October 10, 2009 through November 19, 2009 – 22 days. Zero flow, no discharge during this period . January 23, 2010 – 7 hours. April 10, 2010 through May 13, 2010 – 33 days. Zero flow, no discharge during this period. Days of Relief valve operation were as follows: October 1, 2, 6, February 5, 16, March 31, May 22, August 1, 6. Daily average flow is computed for these days, but hourly discharges shown in the records spreadsheet will not be complete.
Datum Corrections.--	Not applicable.
Rating.--	A differential pressure versus rate of flow rating is used to convert inches of head to flow in cfs. The rating is provided by Primary Flow Signal, the venturi meter manufacturer. Direct current meter measurements have not been done since sometime in the 1980's. A mass balance spreadsheet is routinely used by Otero Pump Station personnel to check discharge at the Spinney Tap. The differential pressure transmitter on the venturi meters was calibrated by the City of Aurora Instrumentation division on March 31, 2010. The transmitters were found to be in tolerances and no adjustments were made. No measurements were made this year. Peak discharge of 119 cfs was the combined flow from both Discharge 1 and Discharge 2 and was recorded at 0945 May 22, 2010.
Discharge.--	Discharge is directly collected from the two venturi meters and reported by the DCP.
Special Computations.--	The DCP reports the data as two discharges (CFS). Each discharge is loaded into its own records spreadsheet as a GH. The program then uses "stconvert" rating which matches GH to Discharge for all values and then computes hourly and daily average discharges to 0.01 cfs. The final daily average discharge is rounded on monthly and yearly summaries to USGS conventions. Daily discharges from each record are totaled in a small ordinary spreadsheet for every day in which the relief valve (Discharge 2) has reported flow. The daily discharges are entered before USGS rounding, when both values are calculated to 0.01 cfs. Thus the combined flow is done to 0.01 cfs. Combined values for every day of the relief valve operation are hand entered as day GH values (0.01 rounding) in the main valve (Discharge 1) record. The program then rounds to USGS standards in the conversion to discharge. This is done only for days of Discharge 2 operation, since all other Discharge 2 days are zero. The yearly peak must be hand checked to make sure that a higher value was not recorded during the relief valve operation.
Remarks.--	The record must be regarded as fair until the meter is calibrated with discharge measurements. Record developed by Mike Wild.
Recommendations.--	Add data logger to ensure more reliable data collection. A Sutron Monitor 1 data logger was purchased pending installation.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR

RATING TABLE--

STCONVERT USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

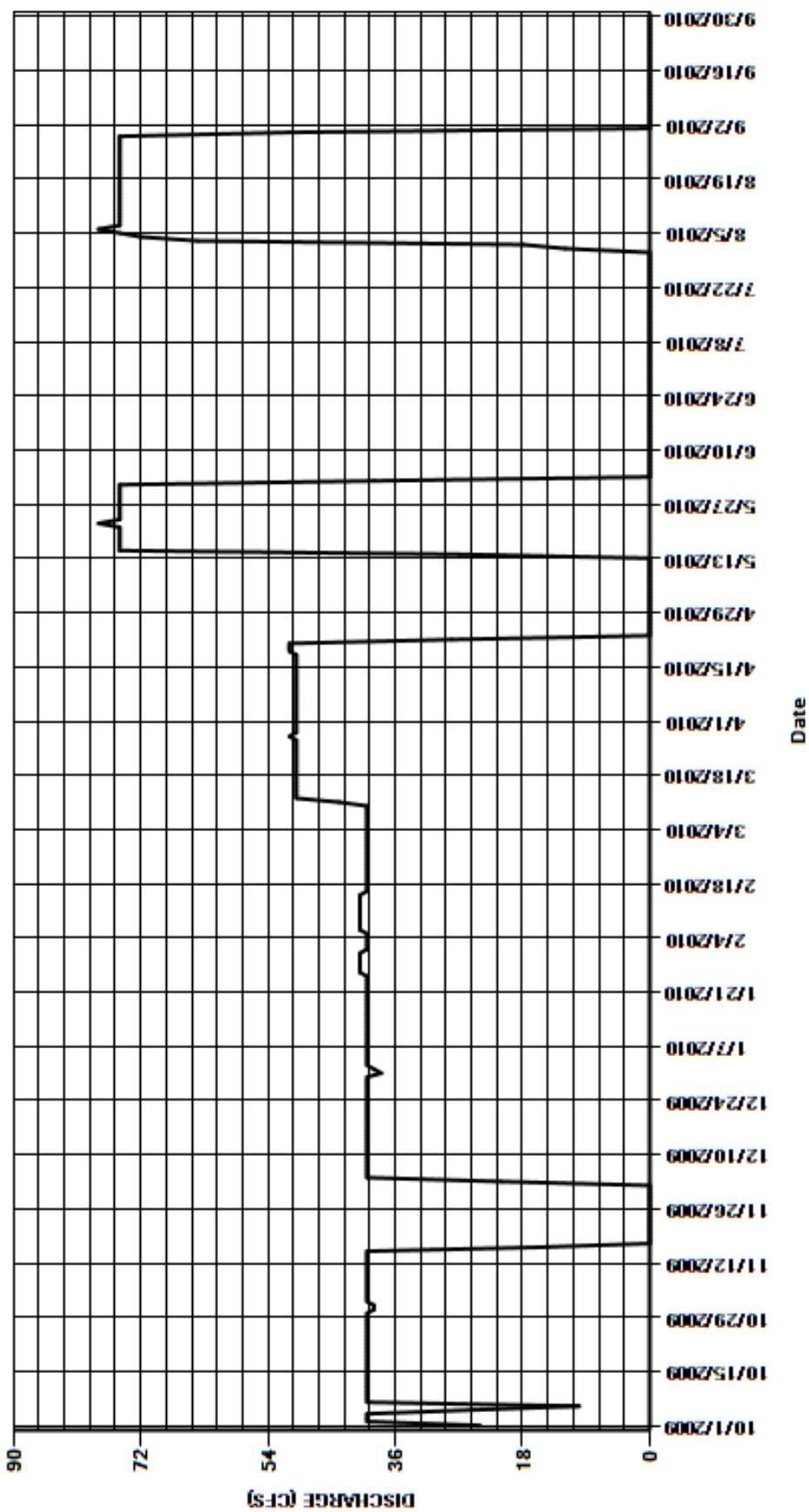
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	39	0	39	40	40	50	0	75	0	12	0
2	40	40	0	40	40	40	50	0	39	0	18	0
3	40	40	21	40	40	40	50	0	0	0	64	0
4	40	40	40	40	40	40	50	0	0	0	72	0
5	25	40	40	40	40	40	50	0	0	0	75	0
6	10	40	40	40	41	40	50	0	0	0	78	0
7	40	40	40	40	41	40	50	0	0	0	75	0
8	40	40	40	40	41	40	50	0	0	0	75	0
9	40	40	40	40	41	40	50	0	0	0	75	0
10	40	40	40	40	41	40	50	0	0	0	75	0
11	40	40	40	40	41	44	50	0	0	0	75	0
12	40	40	40	40	41	50	50	0	0	0	75	0
13	40	40	40	40	41	50	50	0	0	0	75	0
14	40	40	40	40	41	50	50	27	0	0	75	0
15	40	40	40	40	41	50	50	75	0	0	75	0
16	40	16	40	40	40	50	50	75	0	0	75	0
17	40	0	40	40	40	50	50	75	0	0	75	0
18	40	0	40	40	40	50	50	75	0	0	75	0
19	40	0	40	40	40	50	51	75	0	0	75	0
20	40	0	40	40	40	50	51	75	0	0	75	0
21	40	0	40	40	40	50	51	75	0	0	75	0
22	40	0	40	40	40	50	28	78	0	0	75	0
23	40	0	40	40	40	50	0	75	0	0	75	0
24	40	0	40	40	40	50	0	75	0	0	75	0
25	40	0	40	40	40	50	0	75	0	0	75	0
26	40	0	40	41	40	50	0	75	0	0	75	0
27	40	0	40	41	40	50	0	75	0	0	75	0
28	40	0	40	41	40	51	0	75	0	0	75	0
29	40	0	40	41	---	50	0	75	0	0	75	0
30	40	0	40	41	---	50	0	75	0	0	75	0
31	39	---	38	41	---	50	---	75	---	0	51	---
TOTAL	1178	615.00	1139.00	1245	1130	1445	1081.00	1305.00	114.00	0.00	2170	0.00
MEAN	38	20.5	36.7	40.2	40.4	46.6	36	42.1	3.8	0	70	0
AC-FT	2340	1220	2260	2470	2240	2870	2140	2590	226	0	4300	0
MAX	40	40	40	41	41	51	51	78	75	0	78	0
MIN	10	0	0	39	40	40	0	0	0	0	12	0
CAL YR	2009	TOTAL	15053.77	MEAN	41.2	MAX	78	MIN	0	AC-FT	29860	
WTR YR	2010	TOTAL	11422.00	MEAN	31.3	MAX	78	MIN	0	AC-FT	22660	

MAX DISCH: 119 CFS AT 16:45 ON Aug. 05,2010

MAX GH: FT. (not applicable)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
Water Year 2010

Location.--	Lat. 39°21'33", Long. 106°04'37"; Park County, tunnel diverts water from tributaries of Blue River in Colorado River basin to Montgomery Res. (Middle Fork South Platte River) in sec. 14, T. 8 S., R. 78 W., in Platte River basin.
Drainage and Period of Record.--	1952 to present.
Equipment.--	Sutron SatLink 2 Data Collection Platform (DCP) with a Sutron shaft encoder and a Sutron stage-discharge recorder (SDR) on separate floats. Measurement is at an 8-foot metal Parshall flume set in concrete with a metal stilling well. Flume and equipment are housed inside of a diversion tunnel 70 feet from the entrance. The primary gage is a metal tape with reference point mounted in the stilling well. Facilities are owned and maintained by the City of Colorado Springs. Satellite equipment is owned and maintained by the Colorado Division of Water Resources (DWR).
Hydrologic Conditions.--	Transmountain diversion, seasonal operation. Flows are intercepted from Blue River Headwaters and will follow a diurnal pattern as snowpack melts. Diversion can be called out (shut off) by senior water rights on the Blue River and further downstream. The flow is controlled by numerous diversions into the tunnel inlet from the Blue River drainage.
Gage-Height Record.--	The primary record is hourly averages of 15 minute data satellite data with SDR back up. The record is complete and reliable. Gage heights (GH) less than 0.09 ft were considered as non-operational flow. The following days with GH less than 0.09 ft were adjusted to zero for the record: October 1-13, 2009; November 25-December 1, 2009; March 25-April 9, 2010 and September 29-30, 2010. Gage height calibration was good. Nineteen visits were made to the gage. Two adjustments were made to the SE during the period of operational flow. The SDR data agreed with the DCP record to within 0.02 ft.
Datum Corrections.--	Levels were last run on September 28, 2009. The RP was found to be 0.005 ft low (the gage was found to read 0.005 high) which is within the allowable limits of 0.02 ft. No correction to the RP was necessary. However, the drop tape weight was found to be deformed. This caused the tape to be 0.005 ft too long and for the GH to read an additional 0.005 ft high. When the tape and weight were replaced, the tape length was set to the found elevation (4.045 ft instead of the established 4.05 ft.). The 8-foot Parshall flume was found to be 0.02 ft. higher on the LEW side than on the REW side. This is consistent with past results.
Rating.--	Control is a standard 8 foot Parshall Flume and a standard 8 ft PF rating was used. Six measurements were made during the 2010 water year (Nos. 135-140) ranging in discharge from 10.6 to 80.0 cfs. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 8 ft Parshall Flume is 3.50 to 139.5 cfs. Anything above or below this range is outside the +/- 5% accuracy range. The following days had average flows below 3.50 cfs: April 10-18, April 24-May 8, May 12-15 and September 4-10, 2010. The following days had average flows above 139.5 cfs: June 5-7, 2010. The peak flow of 236 cfs occurred at 1915 June 6, 2010 at a gage height of 3.47 ft with a shift of 0.00 ft. It exceeded measurement number 137, made June 2, 2010, by 1.73 ft in stage.
Discharge.--	Shifting control method was used for the water year. Get-away conditions are good; submergence of the control is not a problem. Moss and algae are not a factor, since the flume is in the tunnel. Rust and corrosion in the flume appears to be increasing, and may be affecting the shifts. Shifts may also be affected by deformities in the vertical walls of the flume, which can be observed especially in the area of the staff gage. A shift of 0.00 ft was used throughout the 2010 water year. Measurements within 5 % of the rating were adjusted to zero by agreement with Colorado Springs Utilities. This practice will continue in water year 2011. The range of shift adjustment was -4 to 4 percent. A positive stage shift relationship was recognized for gage heights greater than 1.20 feet in WY2010, however the number of measurements in the upper GH range and the historical data does not support using a stage shift curve for the record. The non-zero range of daily discharge was 0.64 to 236 cfs.
Special Computations.--	Operationally, gage heights (GH) less than 0.09 ft represent zero flow, since the GH's are either a true zero flow or represent water in the stilling well when the tunnel is not in operation and there is no flow in the flume.
Remarks.--	The record is considered good, except for periods when flow was above or below the defined accuracy limits of the rating, which are considered fair to poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Levels should be run in 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA

RATING TABLE--

STD08FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	27	0	0	0	0	0	1.4	101	48	16	9.3
2	0	25	0	0	0	0	0	1.2	81	34	22	8.1
3	0	23	0	0	0	0	0	1.1	65	22	42	4.7
4	0	23	0	0	0	0	0.03	1.1	96	24	28	1.3
5	0	23	0	0	0	0	0.19	1.4	161	33	25	1.2
6	0	22	0	0	0	0	0.22	1.8	185	39	23	1.2
7	0	22	0	0	0	0	0.28	1.7	137	40	19	1.2
8	0	21	0	0	0	0	0.39	2	58	40	31	1.2
9	0	21	0	0	0	0	0.53	4	27	36	36	1.2
10	0	21	0	0	0	0	0.64	5.6	42	43	34	1.2
11	0	21	0	0	0	0	0.92	4.2	56	38	29	2.7
12	0	21	0	0	0	0	1.2	3.3	59	29	32	3.7
13	0	20	0	0	0	0	0.99	3.2	47	26	30	3.8
14	16	19	0	0	0	0	0.9	3	25	26	23	3.8
15	39	20	0	0	0	0	2.1	3.1	20	25	21	3.9
16	35	20	0	0	0	0	3	3.5	21	22	25	3.8
17	26	18	0	0	0	0	2.9	6.7	22	25	26	3.6
18	29	16	0	0	0	0	2.8	13	19	28	21	3.5
19	32	19	0	0	0	0	4.7	12	18	32	21	3.4
20	32	20	0	0	0	0	6.6	12	17	37	23	3.5
21	32	16	0	0	0	0	8.1	23	17	34	19	3.5
22	31	11	0	0	0	0	7.6	32	15	15	18	3.7
23	31	5.1	0	0	0	0	4.5	37	15	18	16	4.7
24	31	1.6	0	0	0	0	2.9	32	18	25	15	4.7
25	31	0.29	0	0	0	0	2.2	23	21	27	15	4.1
26	29	0	0	0	0	0	1.8	32	39	25	13	3.6
27	29	0	0	0	0	0	1.7	51	57	32	13	2.6
28	29	0	0	0	0	0	2.2	77	57	67	12	0.94
29	28	0	0	0	---	0	2.2	86	55	76	13	0
30	28	0	0	0	---	0	1.7	74	49	26	12	0
31	28	---	0	0	---	0	---	79	---	19	10	---
TOTAL	536.00	455.99	0.00	0.00	0.00	0.00	63.29	631.3	1600	1011	683	94.14
MEAN	17.3	15.2	0	0	0	0	2.11	20.4	53.3	32.6	22	3.14
AC-FT	1060	904	0	0	0	0	126	1250	3170	2010	1350	187
MAX	39	27	0	0	0	0	8.1	86	185	76	42	9.3
MIN	0	0	0	0	0	0	0	1.1	15	15	10	0

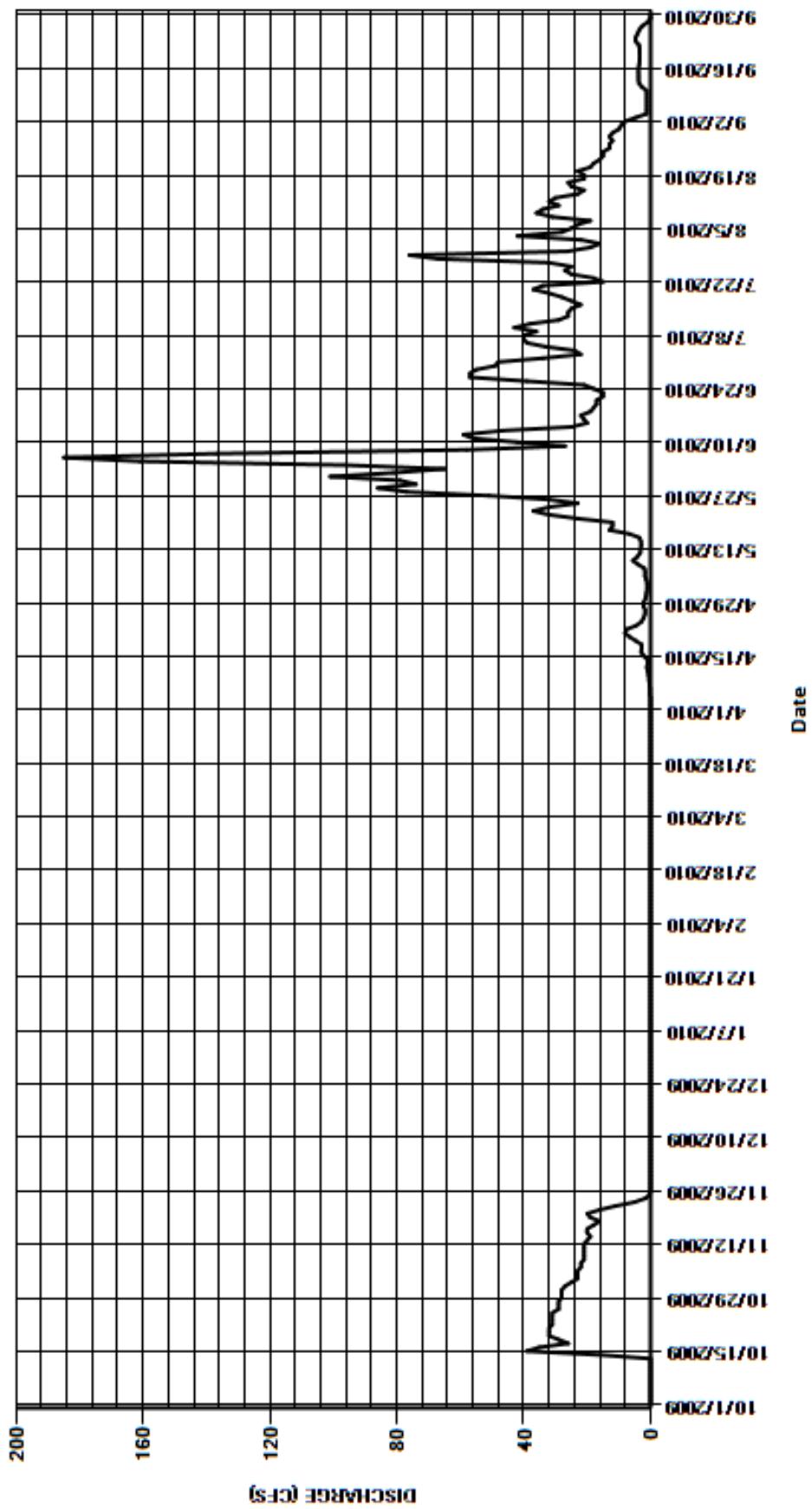
CAL YR	2009	TOTAL	4265.30	MEAN	11.7	MAX	89	MIN	0	AC-FT	8460
WTR YR	2010	TOTAL	5074.72	MEAN	13.9	MAX	185	MIN	0	AC-FT	10070

MAX DISCH: 236 CFS AT 19:15 ON Jun. 06,2010 GH 3.47 FT. SHIFT 0 FT.

MAX GH: 3.47 FT. AT 19:15 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
09046000 BOREAS PASS DITCH AT BOREAS PASS
Water Year 2010

Location.-- Lat 39°24'37", long 105°58'05". Diverts water from tributaries of Blue River in Colorado River basin to Tarryall Creek in sec. 26, T.7 S., R.77 W., in Platte River basin.

Drainage and Period of Record.-- Gage established in 1932, with continuous record from 1950 to present, and for some years prior to 1950.

Equipment.-- Sutron SatLink 2 Data Collection Platform (DCP) with shaft encoder), a Sutron Stage Discharge Recorder (SDR), and a photovoltaic battery charging system at a 1.5 foot Parshall flume with a metal stilling well. The ditch travels underground where the flume and equipment are housed inside a manhole. The flume is set into the concrete pipeline, approximately 14 ft underground. A staff gage in the flume is used as the primary reference gage. The gage and equipment are owned by the City of Englewood. The DCP and ditch gates are operated by an independent contractor under a contract arrangement with Englewood.

Hydrologic Conditions.-- Alpine tundra, willows and talus slopes above timberline.

Gage-Height Record.-- The primary record is hourly averages of 15 minute data satellite data. A Sutron SDR is utilized for data back up. The gage was operated and satellite data were collected from 1250 May 26 to 0935 July 28, 2010. The record for the period of operation is complete and reliable. The gage was visited 5 times during the 2010 water year. The primary and backup records agree within 0.02 ft. The days with partial data on start up and shut down of satellite equipment were hand entered into the record (zero flow days). Apparently precipitation affected GH June 8, 9, 10, 2010 before diversion was opened and was included in the record.

Datum Corrections.-- No levels have been run and no datum corrections were used for the record. The flume was installed in 1992, and appears to be level perpendicular with stream flow, with all measurements this year showing consistent depths at all verticals. However a hand level shows a slight increase in elevation towards the downstream end of the flume.

Rating.-- The control is a 1.5 foot Parshall flume, with a standard rating, STD01HFTP. One discharge measurement (No. 29) was made this year with discharge of 2.99 cfs at a GH of 0.69 ft. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 1.5 ft Parshall Flume is 0.15 to 24.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range. All flows during the 2010 water year were within this range during the operational period of the gage. The peak flow of 3.47 cfs occurred at 2215 June 11, 2010 at a gage height of 0.74 ft with a shift of -0.04 ft. It exceeded measurement No. 29 by 0.05 ft in stage.

Discharge.-- The shifting control method was used for all periods of the record. Negative shifting is most likely caused by the flume being out of level longitudinally but not by mass. A shift of -0.05 ft was found with this year's measurement. This measurement was discounted by 3% to a -0.04 ft shift to match historical measurements. Stage shifting was not observed and the shift was distributed by time.

Special Computations.-- Point of zero flow (PZF) has been observed at a gage height of 0.09 ft. This indicates the height of the intake above the flume floor which traps water in the stilling well. Gage heights less than 0.09 ft (PZF) were adjusted to zero from May 26-June 7 and from July 18-28, 2010 when the headgate was turned and to equipment shut down.

Remarks.-- The record is good. The gage is seasonal and runs typically from May/June to August. The permanent nature of the flume installation suggests that some permanent level of shift is built into the flume. Station maintained and record developed by Mike Wild.

Recommendations.-- Flume condition should be checked for corrosion and possible remediation.

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09046000 BOREAS PASS DITCH AT BOREAS PASS

RATING TABLE--

STD01HFTP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	1.2	0	0
2	0	0	0	0	0	0	0	0	0	1.1	0	0
3	0	0	0	0	0	0	0	0	0	1.1	0	0
4	0	0	0	0	0	0	0	0	0	1	0	0
5	0	0	0	0	0	0	0	0	0	0.97	0	0
6	0	0	0	0	0	0	0	0	0	0.9	0	0
7	0	0	0	0	0	0	0	0	0	0.85	0	0
8	0	0	0	0	0	0	0	0	0.06	0.79	0	0
9	0	0	0	0	0	0	0	0	0.34	0.72	0	0
10	0	0	0	0	0	0	0	0	0.17	0.67	0	0
11	0	0	0	0	0	0	0	0	1.8	0.63	0	0
12	0	0	0	0	0	0	0	0	3.1	0.56	0	0
13	0	0	0	0	0	0	0	0	2.9	0.5	0	0
14	0	0	0	0	0	0	0	0	2.6	0.45	0	0
15	0	0	0	0	0	0	0	0	2.4	0.4	0	0
16	0	0	0	0	0	0	0	0	2.2	0.36	0	0
17	0	0	0	0	0	0	0	0	2.2	0.35	0	0
18	0	0	0	0	0	0	0	0	2.2	0.17	0	0
19	0	0	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	0	0	0	0	1.9	0	0	0
21	0	0	0	0	0	0	0	0	1.9	0	0	0
22	0	0	0	0	0	0	0	0	1.9	0	0	0
23	0	0	0	0	0	0	0	0	1.8	0	0	0
24	0	0	0	0	0	0	0	0	1.6	0	0	0
25	0	0	0	0	0	0	0	0	1.6	0	0	0
26	0	0	0	0	0	0	0	0	1.5	0	0	0
27	0	0	0	0	0	0	0	0	1.5	0	0	0
28	0	0	0	0	0	0	0	0	1.4	0	0	0
29	0	0	0	0	---	0	0	0	1.3	0	0	0
30	0	0	0	0	---	0	0	0	1.3	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.67	12.72	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	1.32	0.41	0	0
AC-FT	0	0	0	0	0	0	0	0	79	25	0	0
MAX	0	0	0	0	0	0	0	0	3.1	1.2	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

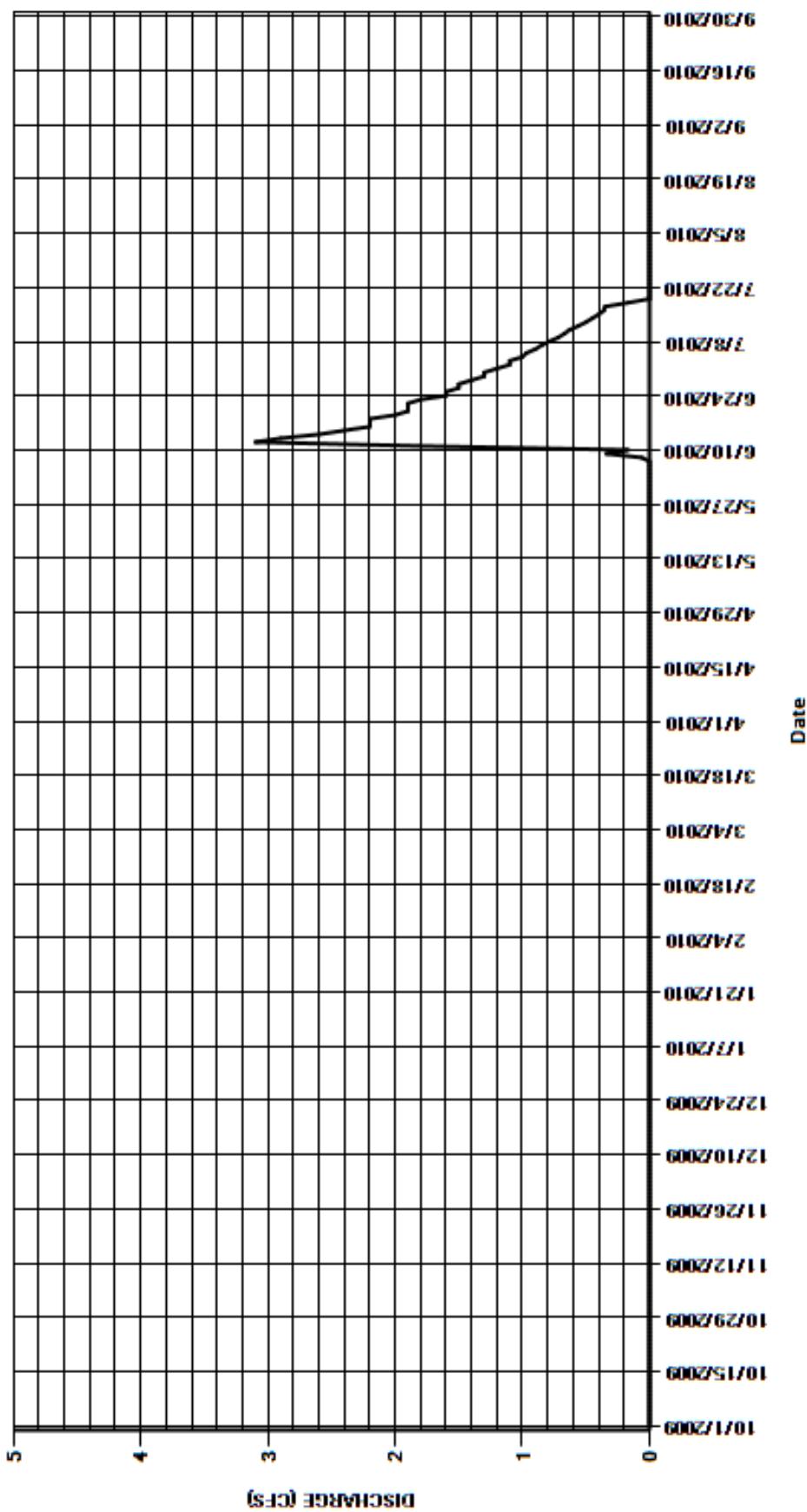
CAL YR	2009	TOTAL	105.38	MEAN	0.29	MAX	2.7	MIN	0	AC-FT	209	
WTR YR	2010	TOTAL	52.39	MEAN	0.14	MAX	3.1	MIN	0	AC-FT	104	

MAX DISCH: 3.47 CFS AT 22:15 ON Jun. 11,2010 GH 0.74 FT. SHIFT -0.04 FT.

MAX GH: 0.74 FT. AT 22:15 ON Jun. 11,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09046000 BOREAS PASS DITCH AT BOREAS PASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
Water Year 2010

Location.--	Lat. 39°27'50", Long. 105°41'01"; Harold D. Roberts tunnel diverts water from Dillon Reservoir in Blue River basin, to North Fork South Platte River (tributary to South Platte River) in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, T. 7 S., R. 74 W., in Platte River basin.
Drainage and Period of Record.--	1963 to present.
Equipment.--	Graphic water stage recorder and Sutron SatLink 2 DCP with digital shaft encoder in a concrete shelter and stilling well at a 20 foot Parshall flume. Primary reference gage is an electric drop tape with a supplemental outside staff gage located in the flume.
Hydrologic Conditions.--	A transmountain diversion delivering water from Dillon Reservoir on the Western Slope to the South Platte River drainage on the Eastern Slope. Change occurs in steps. The Tunnel is shut down at times for maintenance and for water administration.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data with chart backup. The record is complete and reliable. The recording equipment functions well and is considered reliable during cold weather due to a heat lamp and electric heater installed within the shelter and well. During zero-flow periods, there is a residual gage height due to high well inlets, standing water in the flume due to moss, and/or gate leakage. GH's up to about 0.20 ft have been recorded as zero flow, providing that Denver Water Board Department records also show as them zero. In our records program, GH's below a set limit can be imported as zero GH's. When this is done to zero the record, the actual residual GH's will still show on the chart, the GH graphs, and the visit log. This year the import filter was set to zero out data below 0.18 ft, resulting in zero gage height and zero flow being shown for the record on the following days: October 11-14, October 28-November 7, November 27, 2009-March 16, 2010 (Residual GH's 0.08-0.17 ft; Denver notes tunnel "off") April 22-June 6, June 11-24, July 8-11, July 21-23, August 1-6, 2010 .
Datum Corrections.--	Levels were last run across the crest of the flume to the RP on November 27, 2008. The gage was found to read within the +0.02 ft limit.
Rating.--	The control is a standard 20-foot Parshall flume. The standard rating was continued for this year. Six discharge measurements (Nos. 369 - 374) were made this year ranging in discharge from 6 to 361 cfs. STD20FTP is a standard 20-foot Parshall Flume rating. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 20 ft Parshall Flume is 10 to 1000 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. This flume has been further defined by measurements from 2.95 to 575 cfs. Discharges in 2010 were within the rating definition. The peak flow of 398 cfs occurred at 1130 September 28, 2010 at a gage height of 2.77 ft with a shift of 0.04 ft. It exceeded measurement No. 372, made June 10, 2010 by 0.17 ft. in stage.
Discharge.--	Shifts can vary with changes in approach velocities and moss. In a clean flume, positive shifts are seen above about 50 cfs due to approach conditions (flow angles away from the inlets). Also in a clean flume, negative shifts have been consistently seen at flows below about 10 cfs. The low end shift trend was supported by Measurement 370 (6.47 cfs, -0.03 ft. shift) made this year. Such low flows are usually only seen momentarily during tunnel start-up. When moss is allowed to build up, the shift becomes less positive or more negative. Water is usually brought through the tunnel in constant runs for power generation, and turned off periodically for maintenance to the power generation facilities. The trend is for moss-related shifting to build up during the constant runs. When the flow is shut off, the moss dies and a more positive shift is seen at restart. In 2010, the flume was kept clean nearly all year, so there was not much variation in shifts due to moss. Shifts were distributed by time proration through the entire water year except for the period March 16-April 7, 2010, when variable stage shift relationship ROBTUNCOVST01 was used to account for the negative shift seen at 6.5 cfs. Negative shifts were applied during a 7 day period of very low flows experienced during start-up and tunnel maintenance. Of the six measurements made this year, all were given full weight except Measurement No. 369 was discounted 2% and Measurement No. 373 was discounted 1% to smooth shift distribution .
Special Computations.--	An important consideration in shift distribution is the relationship of computed discharges to the flows computed at the North Fork of the South Platte at Grant, ½ mile downstream. Flows at Roberts Tunnel should always be less than Grant. Some native inflow below the Roberts inflow should also be seen at Grant, particularly from Geneva Creek and from Kenosha creek. Shift effects of moss are sometimes worked backward to reconcile flows at Roberts and Grant. A spreadsheet of daily discharges for Roberts Tunnel and North Fork South Platte River at Grant is used to insure that the difference between the two gages is reasonable.
Remarks.--	The record is rated as good. Station maintained and record developed by Patrick Tyler.
Recommendations.--	This record should be worked on a monthly basis to insure that any bad balance of flows existing between Roberts Tunnel and the North Fork South Platte River at Grant gage is addressed promptly. All datum corrections should be applied by manual entry, rather than by time, with consideration to the flows at Grant.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT

RATING TABLE.--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	202	0	0	0	0	0	31	0	0	157	43	295
2	202	0	0	0	0	0	31	0	0	254	0	295
3	202	0	0	0	0	0	31	0	0	304	0	277
4	202	0	0	0	0	0	31	0	0	334	0	283
5	159	0	0	0	0	0	31	0	0	354	0	324
6	77	0	0	0	0	0	31	0	88	305	44	345
7	60	32	0	0	0	0	31	0	278	155	146	345
8	60	49	0	0	0	0	31	0	363	30	181	345
9	60	49	0	0	0	0	31	0	361	0	148	344
10	60	48	0	0	0	0	31	0	359	0	105	288
11	24	48	0	0	0	0	31	0	175	37	91	198
12	0	48	0	0	0	0	31	0	0	117	154	199
13	0	45	0	0	0	0	31	0	0	182	246	199
14	39	49	0	0	0	0	31	0	0	241	301	286
15	61	49	0	0	0	0	43	0	0	283	301	348
16	59	41	0	0	0	1.5	89	0	0	327	258	348
17	59	34	0	0	0	5.4	117	0	0	345	175	328
18	59	36	0	0	0	9.2	128	0	0	357	109	299
19	59	36	0	0	0	12	140	0	0	367	95	301
20	60	36	0	0	0	12	140	0	0	367	95	301
21	60	36	0	0	0	12	141	0	0	194	156	300
22	60	36	0	0	0	16	75	0	0	0	245	299
23	60	35	0	0	0	24	0	0	0	31	294	270
24	60	35	0	0	0	27	0	0	54	97	294	224
25	60	35	0	0	0	27	0	0	98	145	237	224
26	54	35	0	0	0	30	0	0	98	159	197	224
27	51	22	0	0	0	31	0	0	98	247	245	282
28	21	0	0	0	0	31	0	0	98	314	299	368
29	0	0	0	0	---	31	0	0	98	268	297	396
30	0	0	0	0	---	31	0	0	98	151	298	396
31	0	---	0	0	---	31	---	0	---	94	297	---
TOTAL	2130.00	834.00	0.00	0.00	0.00	331.10	1307.00	0.00	2266.00	6216.00	5351.00	8931
MEAN	68.7	27.8	0	0	0	10.7	43.6	0	75.5	201	173	298
AC-FT	4220	1650	0	0	0	657	2590	0	4490	12330	10610	17710
MAX	202	49	0	0	0	31	141	0	363	367	301	396
MIN	0	0	0	0	0	0	0	0	0	0	0	198

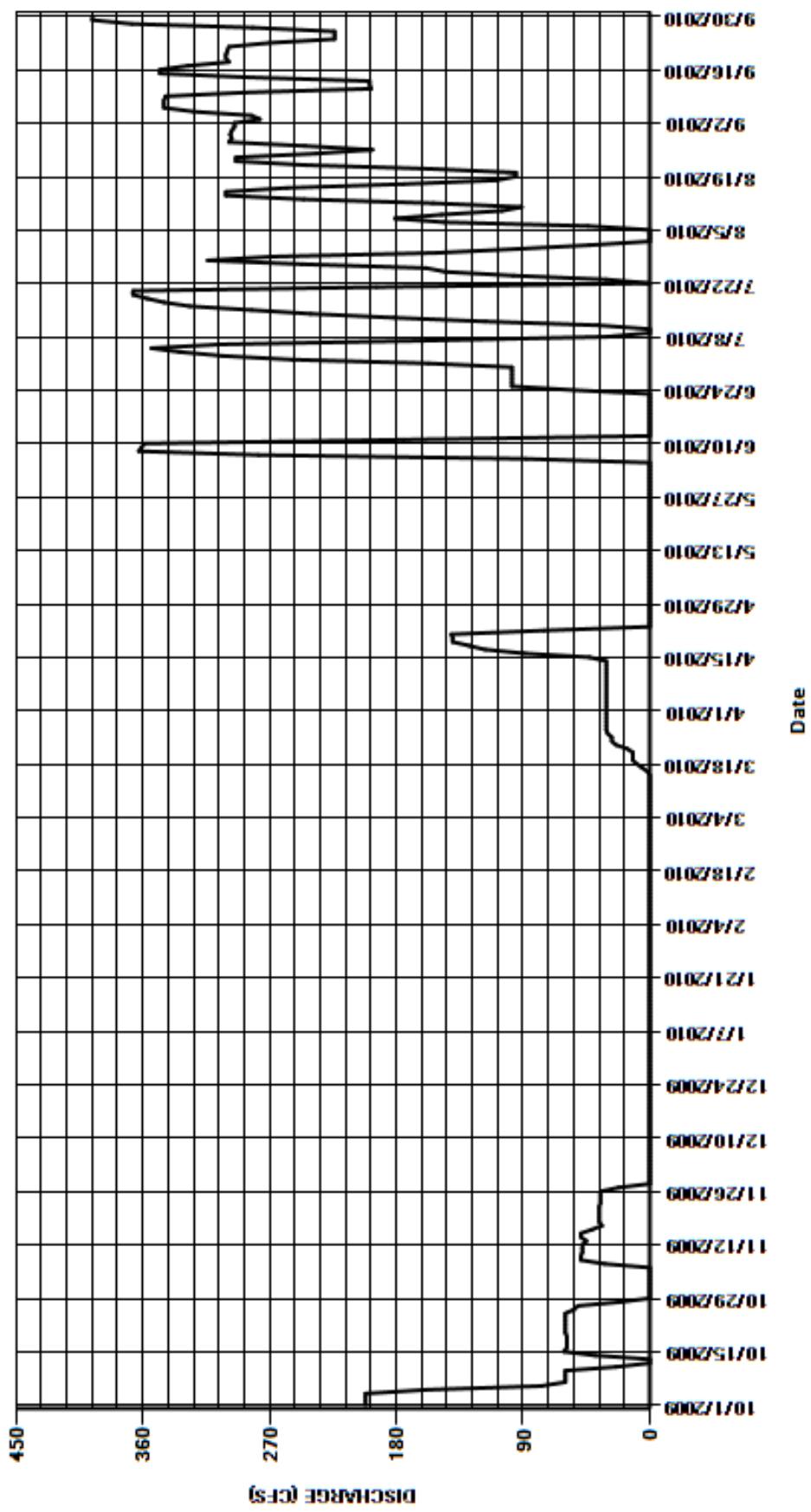
CAL YR	2009	TOTAL	22626.20	MEAN	62	MAX	350	MIN	0	AC-FT	44880
WTR YR	2010	TOTAL	27366.10	MEAN	75	MAX	396	MIN	0	AC-FT	54280

MAX DISCH: 398 CFS AT 11:30 ON Sep. 28,2010 GH 2.77 FT. SHIFT 0.04 FT.

MAX GH: 2.77 FT. AT 11:30 ON Sep. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER
Water Year 2010

Location.--	Lat 39°40'45", long 105°54'12", manhole is located in the East Portal CDOT parking lot between the East and West bound lanes.
Drainage and Period of Record.--	Eisenhower Tunnel seepage with effluent from sewage treatment facility.
Equipment.--	A 12-inch Parshall flume located in a manhole-vault in the CDOT parking lot between eastbound and westbound lanes of I-70. The tunnel pipeline is approximately 12 ft. underground. There is a condensing environment in the tunnel and the moisture has destroyed electronic and electrical equipment placed there previously. Most metal objects are corroded. The air is of possible poor quality within the tunnel, requiring confined space safety measures when the staff is read or measurements are made. A Sutron stage discharge recorder (SDR) was installed on Aug 1, 2007 to better monitor flow conditions in the tunnel and was placed in a NEMA enclosure mounted on the REW of the flume. A second datalogger was installed and tested by Coors this year. The flume staff is the primary reference.
Hydrologic Conditions.--	This is considered to be a transmountain diversion from the Colorado River Basin. The flow is seepage and drainage from cleaning operations inside the Eisenhower Tunnel combined with the effluent from the CDOT facility sewage treatment plant. There is also some degree of runoff from a small drainage immediate to the West Portal which is the source of the water supply for tunnel operations. Spikes in flow originate from the tunnel cleaning operations. The gage shows snow runoff in June. A portion of the water right involved is decreed to be non-tributary since it is claimed to originate in the Tunnel.
Gage-Height Record.--	Primary record is hourly average of 15-minute data from the SDR recorder. The SDR events log showed that the following calibrations were made: +0.02 ft on July 14, -0.02 ft. on August 10, +0.01 ft on November 4, 2010. The +0.02 ft. July calibration was assumed to have been made in error. SDR/well operation may not have been thoroughly checked by a new hydrographer. A -0.02 ft correction was applied from the August 10 visit back to the July 14 visit. This approach is supported by a staff reading made by Coors on July 9, which showed that the SDR reading might have been high at that time. The +0.01 ft calibration on November 4 was assumed to be good and was applied back to zero on August 10. Coors made observations on three dates, but did not record times. Their instrument logged data from July 22 onward, but CDOT reported to Coors that their logger was 0.06 ft high on Sept 4. Coors data was deemed to have little use for back up record. Coors data was loaded into our spreadsheet as a PRM_COMPARE sheet to assist their calibration. Both DWR and Coors showed some degree of inconsistency between primary readings and the data collected, and the two data sets compared poorly considering the accuracy of the instruments. The gage is not visited in the winter since the parking lot is covered with ice and snow. Water continues to run in the tunnel without ice affect. Confined space equipment (Oxygen tester & man-hoist) is used when taking readings.
Datum Corrections.--	Levels were last run May 6, 2009. The gage found to read within allowable tolerance so no changes were made.
Rating.--	A standard 1-ft Parshall Flume table is used. The rating has only been confirmed to 0.93 cfs, but no problems have been observed with the flume so the operation at higher flows is assumed to be as accurate as the measured range. Two measurements were made this year (Nos. 9 -10). The peak flow of 2.32 cfs occurred at 2045 July 28, 2010 at a gage height of 0.74 ft (gage height correction of -0.02 ft applied) with a shift of -0.03 ft.
Discharge.--	Shifting control method was used all year. Shifts are assumed to be caused by flume geometry. Gravel can wash through the flume when the Tunnel is cleaned, but CDOT cleans the pipeline periodically and gravel was not observed in the flume this year. Both WY10 measurements showed shifts of -0.03 ft. These shifts were consistent with measurements made in WY09 and WY11. Shifts were distributed by time using the -0.03 ft shift for the entire year. Measurements were given full weight.
Special Computations.--	
Remarks.--	The record is fair due to the accuracy and limited range of the measurements made, and insufficient staff readings. The accuracy of the measurements can only be considered fair, since the depths involved were at the lower limit for a Pygmy meter. The range of flow is not completely defined, since the highest measurement was 0.91 cfs and the 2010 peak flow was 2.32 cfs. Staff gage and SDR readings should have been better correlated. This record is requested by DWR Division 5 and the Upper Colorado River Commission to complete their accounting of transmountain diversions. Record developed by Bob Cooper.
Recommendations.--	In 2011, these procedures are needed: the gage should be visited monthly with two measurements made during the peak runoff in June. Get visits as early and as late as snow conditions will allow. The well operation should be inspected closely and the free movement of the float, counterweight and tape through the entire expected operational range should be verified. Well inlet from the flume should be verified as clear. Set the SDR to display to 3 decimals and attempt to read staff closer. SDR Data Collection should be set for 5 minute intervals to get better time resolution of the peak flow. Obtain Coors logger reading from CDOT during visits and record this on the visit sheet and field note. CDOT downloads the Coors logger. Get copies of these files. Request that any additional CDOT staff readings be written down and given to us on request. Measurements need to be calculated and reviewed for historic consistency before leaving the gage. An immediate check measurement is absolutely necessary if an outlier shift is computed. Data downloads need to be made AFTER the measurement so that measurement GH can be verified. Data and events should be downloaded separately.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER

RATING TABLE--

STD01FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

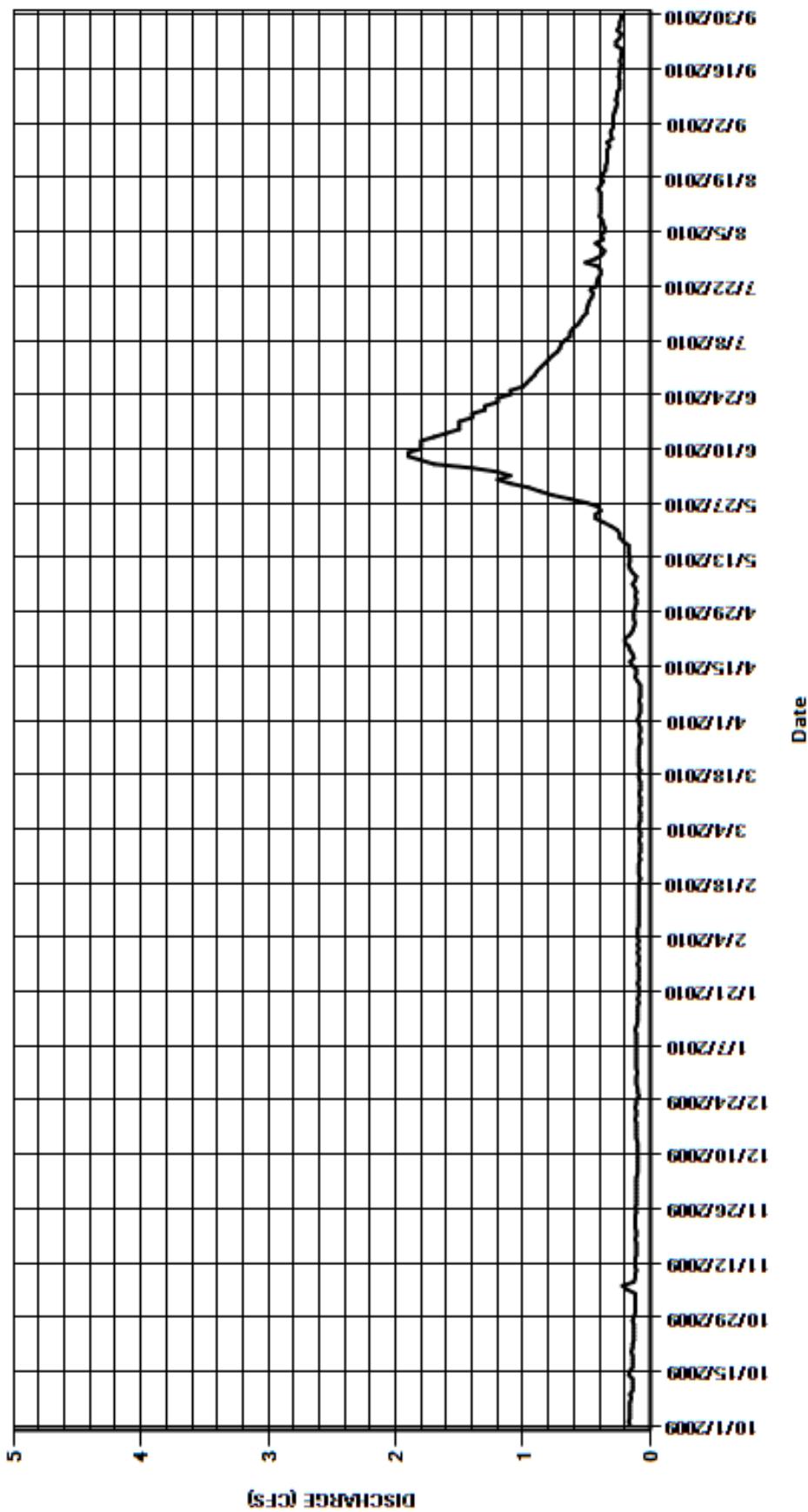
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.16	0.12	0.11	0.11	0.09	0.09	0.1	0.11	1.1	0.86	0.39	0.29
2	0.17	0.12	0.11	0.11	0.1	0.08	0.09	0.11	1.2	0.83	0.43	0.29
3	0.16	0.12	0.11	0.11	0.09	0.08	0.08	0.12	1.1	0.8	0.37	0.29
4	0.16	0.12	0.11	0.11	0.1	0.09	0.08	0.11	1.2	0.77	0.39	0.29
5	0.16	0.18	0.1	0.11	0.1	0.09	0.08	0.12	1.4	0.73	0.36	0.28
6	0.16	0.22	0.1	0.11	0.1	0.08	0.09	0.14	1.7	0.71	0.36	0.27
7	0.16	0.13	0.1	0.11	0.09	0.08	0.08	0.12	1.8	0.7	0.37	0.26
8	0.15	0.12	0.1	0.11	0.09	0.08	0.08	0.11	1.9	0.67	0.38	0.27
9	0.16	0.12	0.1	0.11	0.09	0.09	0.08	0.14	1.9	0.63	0.4	0.26
10	0.14	0.11	0.1	0.11	0.09	0.08	0.08	0.16	1.8	0.63	0.39	0.26
11	0.14	0.12	0.1	0.12	0.09	0.08	0.1	0.17	1.8	0.61	0.39	0.24
12	0.14	0.12	0.1	0.11	0.09	0.08	0.12	0.16	1.8	0.57	0.39	0.24
13	0.14	0.12	0.1	0.1	0.09	0.09	0.11	0.16	1.7	0.55	0.39	0.24
14	0.17	0.11	0.11	0.1	0.09	0.08	0.11	0.17	1.6	0.53	0.39	0.25
15	0.16	0.11	0.11	0.1	0.09	0.08	0.14	0.17	1.5	0.5	0.39	0.24
16	0.14	0.11	0.11	0.1	0.09	0.08	0.16	0.17	1.5	0.5	0.41	0.24
17	0.14	0.11	0.11	0.1	0.09	0.09	0.13	0.21	1.5	0.49	0.39	0.23
18	0.14	0.12	0.11	0.09	0.09	0.09	0.14	0.24	1.4	0.48	0.37	0.24
19	0.14	0.11	0.12	0.1	0.08	0.08	0.16	0.24	1.4	0.46	0.39	0.23
20	0.15	0.11	0.11	0.09	0.09	0.09	0.17	0.26	1.3	0.45	0.37	0.23
21	0.14	0.12	0.11	0.09	0.09	0.09	0.2	0.31	1.3	0.47	0.35	0.22
22	0.14	0.12	0.12	0.09	0.09	0.09	0.2	0.37	1.2	0.42	0.35	0.27
23	0.13	0.12	0.11	0.1	0.09	0.09	0.16	0.43	1.2	0.42	0.34	0.27
24	0.13	0.12	0.11	0.09	0.08	0.09	0.14	0.43	1.1	0.41	0.34	0.24
25	0.13	0.11	0.09	0.09	0.09	0.09	0.13	0.39	1.1	0.39	0.34	0.23
26	0.13	0.12	0.1	0.09	0.08	0.08	0.12	0.41	1	0.39	0.34	0.26
27	0.13	0.11	0.1	0.09	0.08	0.08	0.13	0.5	0.97	0.41	0.32	0.24
28	0.14	0.11	0.11	0.1	0.08	0.09	0.13	0.63	0.94	0.51	0.34	0.24
29	0.13	0.11	0.11	0.09	---	0.08	0.13	0.77	0.91	0.43	0.3	0.23
30	0.12	0.11	0.11	0.09	---	0.08	0.12	0.87	0.89	0.38	0.31	0.23
31	0.12	---	0.1	0.1	---	0.09	---	0.96	---	0.36	0.31	---
TOTAL	4.48	3.65	3.29	3.13	2.51	2.63	3.64	9.26	41.21	17.06	11.36	7.57
MEAN	0.14	0.12	0.11	0.1	0.09	0.085	0.12	0.3	1.37	0.55	0.37	0.25
AC-FT	8.9	7.2	6.5	6.2	5	5.2	7.2	18	82	34	23	15
MAX	0.17	0.22	0.12	0.12	0.1	0.09	0.2	0.96	1.9	0.86	0.43	0.29
MIN	0.12	0.11	0.09	0.09	0.08	0.08	0.08	0.11	0.89	0.36	0.3	0.22
CAL YR	2009	TOTAL	128.41	MEAN	0.35	MAX	1.6	MIN	0.08	AC-FT	255	
WTR YR	2010	TOTAL	109.79	MEAN	0.3	MAX	1.9	MIN	0.08	AC-FT	218	

MAX DISCH: 2.32 CFS AT 20:45 ON Jul. 28,2010 GH 0.74 FT. SHIFT -0.03 FT. (-0.02 FT GH CORR. APPLIED)

MAX GH: 0.74 FT. AT 20:45 ON Jul. 28,2010 (-0.02 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

Water Year 2010

Location.--	Lat. 39°46'13", Long. 105°51'03"; in SW1/4, Sec. 24, T3S, R76W. Two miles east of Jones Pass at Henderson Mine, 11 miles west of Empire, Colorado. Diversion is from tributaries of the Williams Fork River in the Colorado River Basin. Since July, 1959, Gumlick water has been redirected into Vasquez Tunnel to Vasquez Creek in the Frazier River and Colorado River basins. Gumlick Tunnel flows may be released into Clear Creek and must be accounted for as a separate trans-mountain diversion from the Colorado River Basin to the South Platte Basin.
Drainage and Period of Record.--	WY2006 is first year of published record.
Equipment.--	Weekly graphic water stage recorder and a Sutron stage discharge recorder in a square concrete shelter and stilling well at a covered 10 Ft. Parshall flume with 5 ft. walls. The well is connected to the flume with a single 2" inlet set across from the staff. The primary reference gage is a drop tape from an RP with elevation set to the flume crest. A supplemental staff is in the stilling well reads the same as the tape and RP.
Hydrologic Conditions.--	Diversion is from tributaries of the Williams Fork River in the Colorado River Basin between the head gate on the right bank of Bobtail Creek in Sec. 28, T. 3S, R. 76W., and the head gate on the left bank of McQueary Creek in Sec. 16, to the West Fork of Clear Creek in Sec. 24 in the South Platte River Basin. Since July, 1959, Gumlick water has been redirected through Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. , R. 76W, in the Frazier River and Colorado River Basins. Delivery through the 10 ft. Parshall into Clear Creek since the completion of Vasquez Tunnel in 1958 was rare prior to 2009. Currently, Denver has contracted with Golden to supply a small amount of water each year to Guanella Reservoir, delivered in one run.
Gage-Height Record.--	The record is hourly averages of 15-minute data taken from the SDR logger with weekly chart back up. The chart recorder is maintained by Denver Water. The record is complete and reliable. The GH was verified every day of the release by water commissioner visits recorded in the SDR events log, and confirmed in phone conversation. The recorder was also found to be correctly set when the data was downloaded on July 14, 2010. No visit sheet was kept. The chart agreed with the SDR within 0.02 ft. Water was run only during June 25-30. Non-zero GH's recorded October 1 through June 16 were due to residuals in the well and/or snow and ice in the flume. Snow and ice were cleaned from the flume on June 16.
Datum Corrections.--	Levels were last run on July 29, 2009, using the average flume crest as zero. The staff was found to read 0.07 ft low. The RP and drop tape were set to the flume crest at that time. Datum of gage is 10.312.5 ft. (Levels are run by the City of Denver).
Rating.--	A standard 10 ft Parshall Flume rating table was used. No measurements were made this year since the hydrographic branch was not notified of the release dates. One measurement was made in 2009, using the staff as a reference. The peak flow of 14.3 cfs occurred at 1715 June 29, 2010 at a gage height of 0.46 ft with a shift of +0.07 ft.
Discharge.--	The WY09 measurement was applied to the 2010 period of record, but the shift was corrected from +0.14 ft (based on the staff) to +0.07 ft (based on the flume crest/RP). This ASSUMED shift is derived from the July 29, 2009 levels showing that the staff was 0.07 ft low with respect to the flume crest. There is potential for error in the assumed shift because use of the stilling well RP is new and no observations have been recorded comparing actual staff reading to well readings. Shifts are affected by release gate conditions. When water is being delivered to the Moffat system, the delivery to the Clear Creek flume is under pressure. Flow squirts out from under the gate. Flow in the flume is very fast, rough and unevenly distributed across the flume. When water is not being delivered, one or both of the gates are completely open. Flow is not under pressure, but does enter the flume at a right angle and pile-up on the inlet side is possible. The degree of this angular flow could also depend on whether both gates are open or only one. This year delivery occurred when no water was going to the Moffat system. Flow was controlled from the west slope and the Clear Creek delivery gate was completely open. Due to the flume cover, only wading measurements are possible, and the flume can only be entered by wading through the back.
Special Computations.--	None.
Remarks.--	Water was released for 5 days in 2010. The record is considered fair to poor, because no measurements were made, and no observations were recorded comparing the staff GH to the stilling well. Record developed by Bob Cooper.
Recommendations.--	Flume and gate conditions during releases should be photographed and documented, and both staff and stilling well readings should be taken. If the Tunnel is running water to the Moffat system, a copy of the chart from the downstream flume should be obtained for comparison. In 2010, Denver did NOT notify the hydrographic staff of the release, and neither did the commissioner. Denver, the Commissioner, and Golden should all be asked to independently provide notification of a release. It is imperative that hydrographers measure and document these releases. Observations and measurements during different gate scenarios are needed to establish the most reliable measurement conditions and request cooperation from Denver. The water is being released to Golden and Golden staff seem to have more knowledge about release plans than Denver does.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

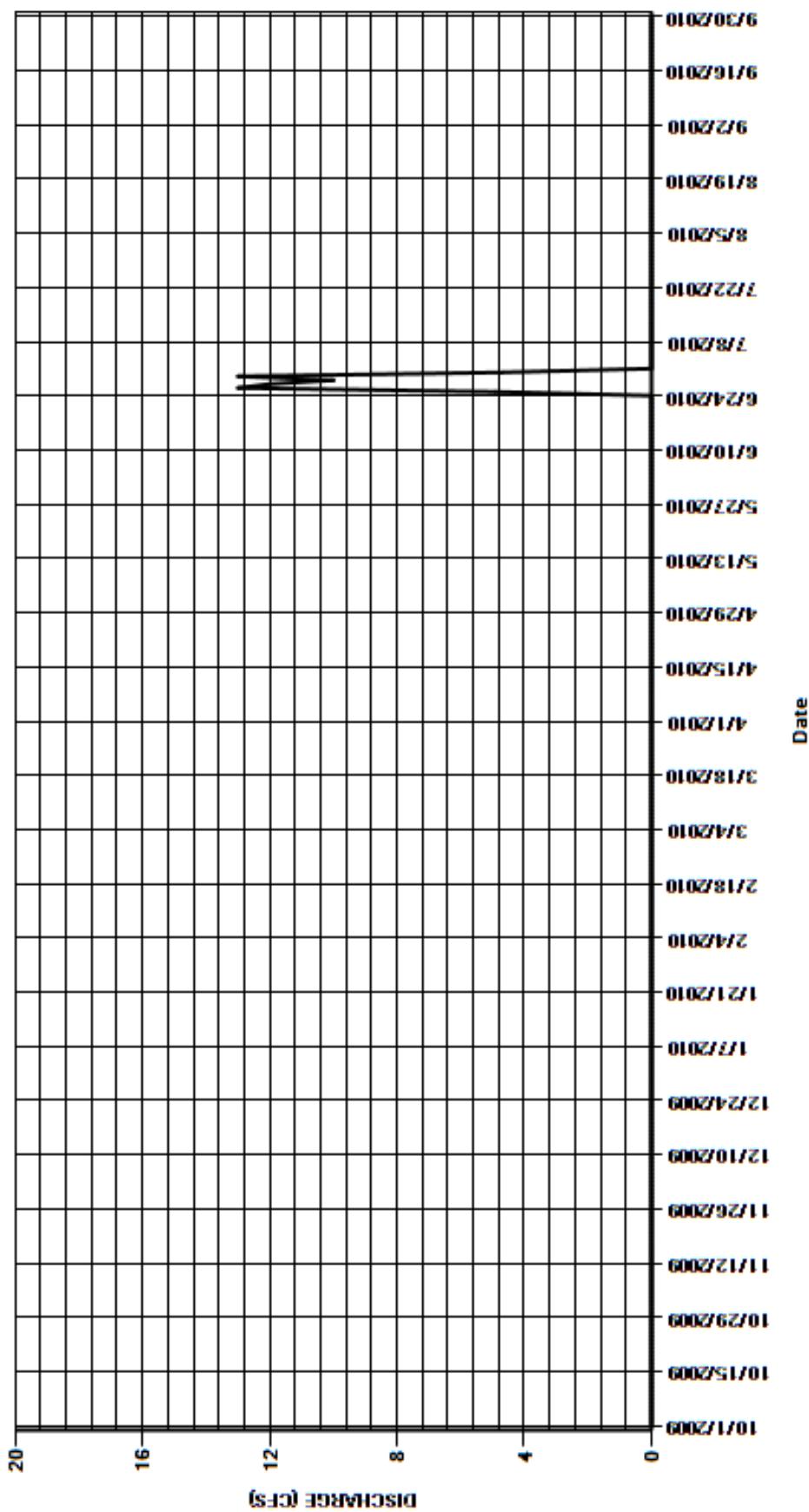
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	4.9	0	0	0
26	0	0	0	0	0	0	0	0	13	0	0	0
27	0	0	0	0	0	0	0	0	12	0	0	0
28	0	0	0	0	0	0	0	0	10	0	0	0
29	0	0	0	0	---	0	0	0	13	0	0	0
30	0	0	0	0	---	0	0	0	4.7	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.60	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	1.92	0	0	0
AC-FT	0	0	0	0	0	0	0	0	114	0	0	0
MAX	0	0	0	0	0	0	0	0	13	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0
CAL YR	2009	TOTAL	206.00	MEAN	0.56	MAX	20	MIN	0	AC-FT	409	
WTR YR	2010	TOTAL	57.60	MEAN	0.16	MAX	13	MIN	0	AC-FT	114	

MAX DISCH: 14.3 CFS AT 17:15 ON Jun. 29,2010 GH 0.46 FT. SHIFT 0.07 FT.

MAX GH: 0.46 FT. AT 17:15 ON Jun. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AUGUST P. GUMLICK TUNNEL AKA JONES PASS TUNNEL RELEASE TO CLEAR CREEK
WY2010 HYDROGRAPH



BLUE RIVER BASIN
09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
Water Year 2010

Location.-- Lat. 39°37'28", Long. 105°47'28", sec.6, T.5 S., R.75 W., Summit County, at Argentine Pass above Keystone Ski Area.

Drainage and Period of Record.-- 1971 to present.

Equipment.-- Sutron SatLink 2 Data Collection Platform (DCP) in a shelter near the tunnel entrance monitoring a Sutron encoder at a prefabricated steel three-foot Parshall flume. City of Golden also operates a Sutron Stage Discharge Recorder (SDR) on its own float. The flume is inside the tunnel, approximately 320 feet from the (DCP). The primary reference is the flume staff gage.

Hydrologic Conditions.--

Gage-Height Record.-- The primary record is hourly averages of 15-minute data taken from satellite telemetry and logged data by either the Satlink Transmitter or Golden's SDR encoder/logger. Independent back-up data can be obtained from Golden's SDR logger. The record is complete and reliable, except for the following periods: May 24-26, 2010, start up. Data from Golden's logger was used to establish the start-up period. The SDR could not be set accurately on May 24 due to ice in the well. June 11-15, 2010, DCP failure, data filled in from SDR log. The data obtained from the SDR showed a calibration correction error with respect to the shaft encoder of -0.01 ft prior to the DCP failure and no calibration correction needed after the DCP was repaired without any accompanying documentation showing a calibration correction made to Golden's SDR. Satellite telemetry data began on May 26. Many transmissions were missed throughout the season, so the record was developed from the logged Satlink data and one period (June 11-15) of SDR data. The hours before and after start-up and shut-down on May 24 and August 24 were assumed to be zero. A residual GH of 0.16 ft. was recorded from August 24 to September 30 following Golden's discontinuation of diversions on August 24, 2010. Stage for this period was assumed to be zero and the float was presumed to be bottomed out in the well. Comparison of DWR data with Golden's logger was generally within 0.02 ft , after adjusting for multiple independent instrument calibration corrections. Two calibration corrections were made, both -0.03 ft. The correction made June 15 was distributed back to zero at the previous visit/measurement of May 26. The August 5 correction was applied back to zero on August 4, based on comparison to Golden's logger which had been set correctly on August 3. Both recorders logged the same yearly peak of 1.39 ft at 1645 August 3, 2010. Golden's data were not useful for the June correction since its calibration and subsequent calibrations corrections varied greatly with little documentation provided to substantiate the corrections logged by Golden's instrument.

Datum Corrections.-- Levels were run on June 23, 2000. The staff gage was found to be correctly set with respect to the crest of the flume. Flume dimensions were found to be within close agreement of design parameters, although the floor at the crest does have some slope up towards the crest in the converging section. There is nearly one foot of getaway within 8 ft downstream of the exit of the flume.

Rating.-- The control is a 3-ft steel Parshall flume. Rating table is a standard 3 ft Parshall flume table (STD03FTP). Five measurements (Nos. 37-41) were made in 2010 ranging in discharge from 0.72 to 10.4 cfs. A notched index board is installed on the flume to insure current meter measurement sections are consistent. The measurement section width is 4.5 ft. Measurements 37 and 38, both made when the telemetry was installed on May 26, had questionable gage heights. No gage height data were being logged, and staff readings were poorly recorded. Calibration on Golden's logger, which was operating, was inconsistent. Golden's stage data was used for the measurements, which yielded shifts of -0.05 and -0.06 ft. respectively. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 3 ft Parshall Flume is 0.61 to 50.4 cfs. Anything above or below this range is outside the +/- 5% accuracy range. All flows during the 2010 water year were within this range during the operational period of the gage. The peak flow of 19.0 cfs occurred at 1645 August 3, 2010 at a gage height of 1.39 ft with a shift of -0.05 ft. It exceeded measurement No. 41 made August 5 by 0.41 ft in stage and 8.6 cfs.

Discharge.-- Negative shifts are most likely caused by the floor of the flume sloping up towards the crest in the converging section of the Parshall flume. Measurements showed shifts ranged from -0.04 to -0.07 ft with the -0.06 ft shift associated with the start up measurements discussed above. Shifts for measurements 40 and 41 were adjusted to -0.05 ft, allowing that shift to be used entirely for May 31 to the end of the season. The -0.06 ft from the May 26 measurements was only used for the few days when start up flows had low stage.

Special Computations.-- May 24-25 was estimated from Golden's logged data using a -0.20 ft correction made when their SDR was set on May 26. May 26 was estimated from 12 hours of Golden's data (corrected as above) plus 12 hours of good record.

Remarks.-- The record is considered good, except for May 24, 25 and 26 which are considered estimated and poor, and June 11-15, 2010 which is considered fair. Record developed by Bob Cooper and Russell Stroud.

Recommendations.-- Greater care should be taken in recording measurement staff readings and calibration information. The reading of Golden's logger should also be recorded on our measurement field notes. Remember to always measure AFTER the telemetry is up and logging, and to always download both data and events logs AFTER the measurement. Golden's SDR should not have required so many corrections. The source of the corrections should be investigated and Golden's visit procedures audited.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS

RATING TABLE--

STD03FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	9.5	5	6.2	0
2	0	0	0	0	0	0	0	0	6.3	4.8	8	0
3	0	0	0	0	0	0	0	0	5.1	4.5	14	0
4	0	0	0	0	0	0	0	0	8.7	4.2	14	0
5	0	0	0	0	0	0	0	0	10	3.8	11	0
6	0	0	0	0	0	0	0	0	10	3.4	9.7	0
7	0	0	0	0	0	0	0	0	9.4	3.3	8.2	0
8	0	0	0	0	0	0	0	0	10	3.1	7.3	0
9	0	0	0	0	0	0	0	0	12	2.8	6.3	0
10	0	0	0	0	0	0	0	0	9.8	2.7	5.5	0
11	0	0	0	0	0	0	0	0	9.3	2.6	4.8	0
12	0	0	0	0	0	0	0	0	9.9	2.5	4.4	0
13	0	0	0	0	0	0	0	0	7.3	2.3	3.9	0
14	0	0	0	0	0	0	0	0	6.1	2.2	3.5	0
15	0	0	0	0	0	0	0	0	6.7	2	3.2	0
16	0	0	0	0	0	0	0	0	8.3	1.9	3	0
17	0	0	0	0	0	0	0	0	8.8	1.8	2.8	0
18	0	0	0	0	0	0	0	0	8.9	1.7	2.6	0
19	0	0	0	0	0	0	0	0	9.1	1.6	2.5	0
20	0	0	0	0	0	0	0	0	8.7	2	2.3	0
21	0	0	0	0	0	0	0	0	7.7	2.3	2	0
22	0	0	0	0	0	0	0	0	7.6	1.8	1.9	0
23	0	0	0	0	0	0	0	0	7.7	1.6	1.8	0
24	0	0	0	0	0	0	0	0.5	7.5	1.6	0.74	0
25	0	0	0	0	0	0	0	1.5	6.9	1.7	0	0
26	0	0	0	0	0	0	0	1.5	6.5	1.5	0	0
27	0	0	0	0	0	0	0	2.3	5.9	1.7	0	0
28	0	0	0	0	0	0	0	3.3	5.4	1.9	0	0
29	0	0	0	0	---	0	0	3.8	5.4	3.7	0	0
30	0	0	0	0	---	0	0	4.7	5.3	4.9	0	0
31	0	---	0	0	---	0	---	7.8	---	4.9	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.40	239.8	85.8	129.64	0.00
MEAN	0	0	0	0	0	0	0	0.82	7.99	2.77	4.18	0
AC-FT	0	0	0	0	0	0	0	50	476	170	257	0
MAX	0	0	0	0	0	0	0	7.8	12	5	14	0
MIN	0	0	0	0	0	0	0	0	5.1	1.5	0	0

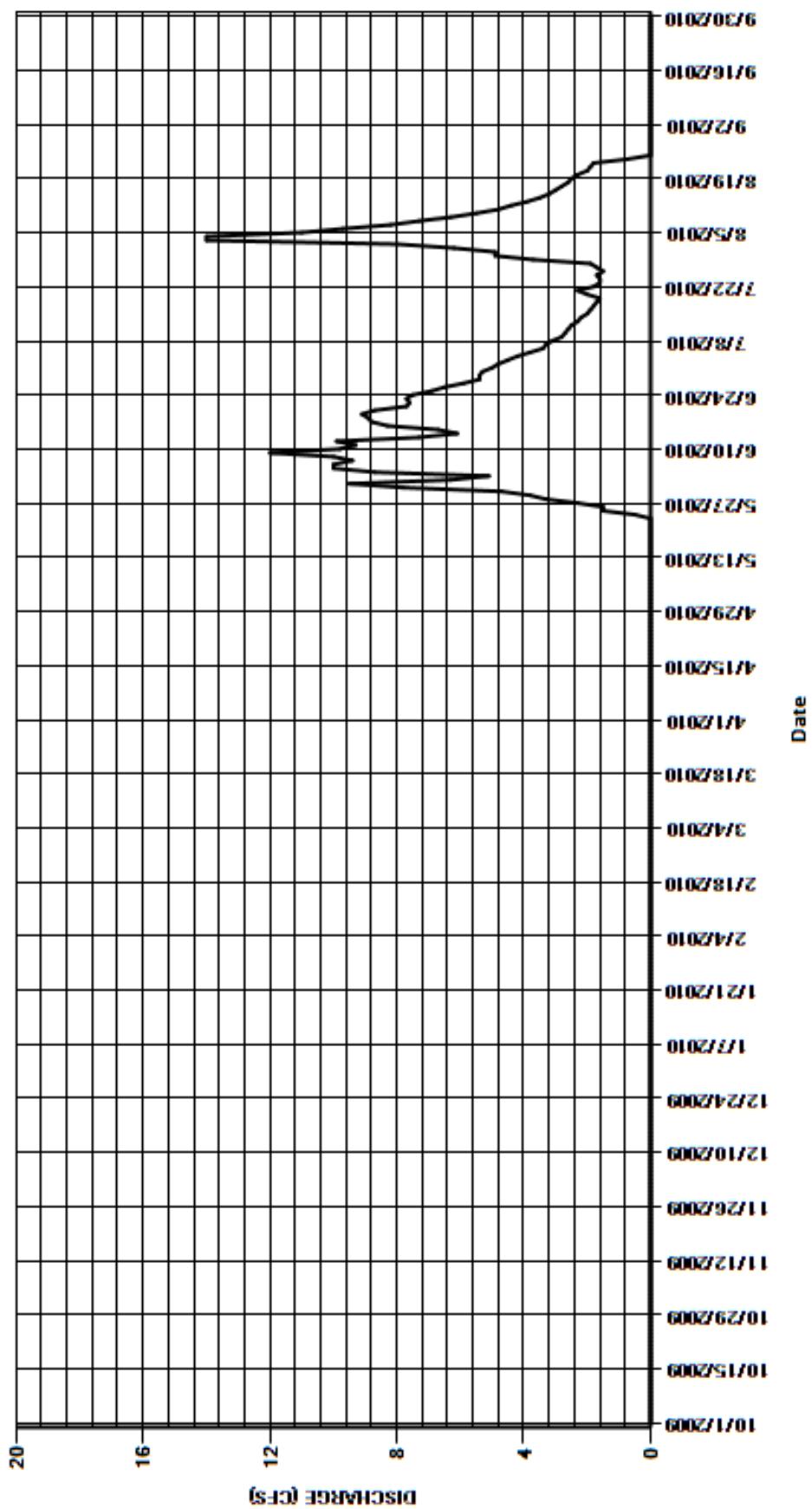
CAL YR	2009	TOTAL	647.70	MEAN	1.77	MAX	18	MIN	0	AC-FT	1280
WTR YR	2010	TOTAL	480.64	MEAN	1.32	MAX	14	MIN	0	AC-FT	953

MAX DISCH: 19 CFS AT 16:45 ON Aug. 03,2010 GH 1.39 FT. SHIFT -0.05 FT.

MAX GH: 1.39 FT. AT 16:45 ON Aug. 03,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS

Water Year 2010

Location.--	Lat. 39°47'56", Long. 105°46'36"; Berthoud Pass Ditch diverts water from tributaries of Fraser River between headgate in sec. 33, T. 2 S., R. 75 W., Grand County, and Berthoud Pass, in Colorado River basin, to Hoop Creek, tributary to west fork Clear Creek in sec. 10, T. 3 S., R. 75 W., in Platte River Basin.
Drainage and Period of Record.--	July 1932 to present.
Equipment.--	Sutron shaft encoder connected to a Sutron Satlink Data Collection Platform (DCP) in a 42-inch corrugated metal pipe (CMP) shelter and well at a 30 inch by 9 foot cutthroat flume. The stilling well has been divided to accommodate both an Ha and Hb stilling well. The primary reference is a metal drop tape with an adjustable reference point (RP) located on the instrument shelf above the Ha well with a supplemental staff gage located at the flume's right-edge-of-water Ha location. There is no RP or staff gage present for the Hb flume components. The gage is owned and operated by the City of Northglenn.
Hydrologic Conditions.--	The ditch drainage is nearly all above tree line and is adjacent to the Berthoud Pass ski area. The ditch runs parallel to US Highway 40 for part of its length and acts to divert snowmelt away from the uphill side of the road. Construction was done at the gage in October and November 2007 to cover the ditch. Prior to construction, snow-plows and traffic would drop debris into the ditch. The incoming ditch itself was replaced with a 36 inch CMP conduit and the flume was covered with sheets of metal. An extra foot of concrete was also added to the walls of the flume, extending them from 3 ft. to 4 ft. in height. The exiting ditch was replaced with a 36 inch corrugated plastic pipe conduit with extensive dirt work done in the gage's vicinity. On September 18, 2009 the flume's inlet was observed to be at a gage-height of 0.13 ft whereas the flume's point of zero flow (PZF) was observed to occur at a staff reading of 0.04 ft. Residual stilling well readings of 0.13 feet and below are assumed to be zero flow.
Gage-Height Record.--	The record is hourly averages of 15-minute telemetered encoder data with no back-up provisions. The record is complete and reliable, except for June 15-17, 2010. The gage was activated by DWR on June 15, 2010 at 17:00 and set to a stage of 0.14 feet. Stage fell to negative values which are impossible due to the residual GH observed for the stilling well. It was assumed that the shaft encoder was set up in reverse. On June 17, 2010 at 09:00 an undocumented correction was made to the encoder, setting it to positive values. At 14:00 values began to rise in a manner consistent with ditch start-up operations. When the gage was visited by DWR on June 22, 2010 the encoder was found to be working properly with a +0.02 foot correction. So it was further assumed that Northglenn fixed the reversal sometime during 0900 to 1400 when the ditch was fully opened, and that the +0.02 ft correction made on June 22 would apply back to 1400 on June 17. The assumed reversal period was corrected using a reversal base of 0.14 ft, and the hours between 0900 and 1400 on June 17 were estimated by interpolation. The diversion was active and water was run from June 15 to September 20, 2010.
Datum Corrections.--	The RP and tape were established with respect to the throat of the flume on June 20, 1989. Levels were run on October 9, 2008 and the gage was found to be reading 0.04 ft low. The RP was adjusted back to the 6.630 ft (original Elev.) Movement was possibly caused by construction activities in October and November 2007. Levels were run again on July 14, 2009; November 10, 2009 and August 10, 2010. The RP was found to be in tolerance in all instances.
Rating.--	Prior to 2008, the control was a 2.50-foot by 9-foot cutthroat flume, which used a standard cutthroat rating (BERDITCO01). Pipe-lining the ditch negated the control of the flume. The control is now the downstream corrugated plastic pipe below the flume. The departing pipe has an invert of 0.04 feet higher than the average flume throat, resulting in submergence of the flume throughout the range of flow. Rating No. 2 was developed in water year 2008 and is based on seven measurements (Nos. 112-118), ranging in discharge from 0.82 to 7 cfs. This rating has subsequently been confirmed by measurements with a range of 0.27 to 9.44 cfs. Five measurements (Nos. 127-131) were made this year ranging in discharge from 0.27 cfs to 9.44 cfs. Discharge measurement made this year cover the range in daily flow experienced. The peak flow of 10.1 cfs occurred at 1515 June 17, 2010 at a gage height of 1.34 ft (gage height correction of +0.02 ft applied) with a shift of 0.06 ft. It exceeded measurement No. 127 made June 22, 2010 by 0.02 feet of stage and 0.66 cfs.
Discharge.--	Flume remained clear of any obvious debris or obstructions throughout the year. Measurements made this year were consistently positive, but followed the rating curve slope, and showed unadjusted shifts from 0.03 to 0.06 feet.. Shifts were distributed by stage for the period of operation, June 15-September 20, 2010, using variable stage-shift relationship BERDITCOVST10-1, which is based on five measurement (Nos. 127-131) made during the period of use. All measurements were given full weight except for: No. 129 was discounted -4% to smooth the shift distribution
Special Computations.--	The reversal period at start-up was estimated by putting the hourly GH's into a spreadsheet and computing corrected GH's. Since the reversal base was 0.14 ft, the computation was $0.14 + (0.14 - \text{GH})$.
Remarks.--	The record is good except for June 15-17, 2010 which is considered fair due to assumed reversal errors and undocumented corrections being made to the encoder during this period. This includes the peak event occurring at 1515 June 17, 2010. Record developed by Russell V. Stroud.
Recommendations.--	Better coordination and documentation of Northglenn's operations should be strived for. Requesting Northglenn's staff to log their visits to the gage would also be highly valuable. Visits should be made every two weeks throughout the water year to ensure the flume is clear and to ensure instrument calibration. Additionally, better observations of site and flow conditions should be documented on the station's visit log as well as current meter notes. Higher flow measurements should be sought to extend the BERDITCO02 or subsequent ratings.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS

RATING TABLE--

BERDITCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

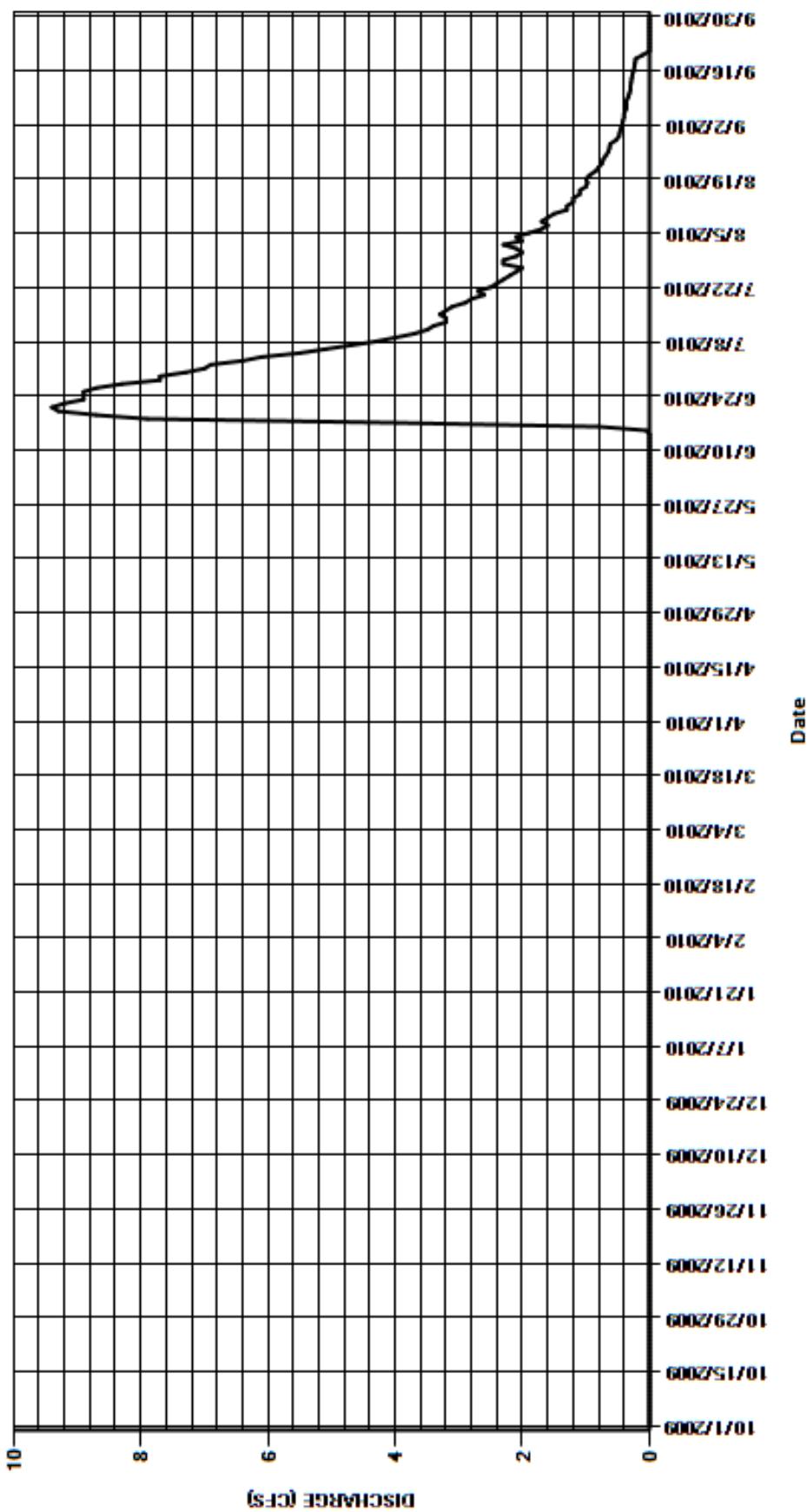
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	7	2.1	0.45
2	0	0	0	0	0	0	0	0	0	6.9	2.3	0.43
3	0	0	0	0	0	0	0	0	0	6.4	2	0.42
4	0	0	0	0	0	0	0	0	0	6.1	2.1	0.4
5	0	0	0	0	0	0	0	0	0	5.5	1.9	0.4
6	0	0	0	0	0	0	0	0	0	5.1	1.7	0.37
7	0	0	0	0	0	0	0	0	0	4.7	1.6	0.36
8	0	0	0	0	0	0	0	0	0	4.3	1.7	0.37
9	0	0	0	0	0	0	0	0	0	4	1.6	0.34
10	0	0	0	0	0	0	0	0	0	3.7	1.5	0.32
11	0	0	0	0	0	0	0	0	0	3.5	1.3	0.3
12	0	0	0	0	0	0	0	0	0	3.4	1.3	0.3
13	0	0	0	0	0	0	0	0	0	3.2	1.2	0.29
14	0	0	0	0	0	0	0	0	0	3.2	1.2	0.28
15	0	0	0	0	0	0	0	0	0.05	3.3	1.1	0.27
16	0	0	0	0	0	0	0	0	0.8	3.2	1.1	0.25
17	0	0	0	0	0	0	0	0	4	3.1	1	0.24
18	0	0	0	0	0	0	0	0	7.9	2.9	0.98	0.23
19	0	0	0	0	0	0	0	0	8.7	2.8	1	0.22
20	0	0	0	0	0	0	0	0	9.3	2.6	0.94	0.11
21	0	0	0	0	0	0	0	0	9.4	2.7	0.85	0
22	0	0	0	0	0	0	0	0	9.2	2.5	0.8	0
23	0	0	0	0	0	0	0	0	8.9	2.4	0.75	0
24	0	0	0	0	0	0	0	0	8.9	2.3	0.73	0
25	0	0	0	0	0	0	0	0	8.9	2.2	0.69	0
26	0	0	0	0	0	0	0	0	8.7	2.1	0.65	0
27	0	0	0	0	0	0	0	0	8.3	2	0.63	0
28	0	0	0	0	0	0	0	0	7.7	2.3	0.62	0
29	0	0	0	0	---	0	0	0	7.7	2.3	0.53	0
30	0	0	0	0	---	0	0	0	7.3	2.1	0.48	0
31	0	---	0	0	---	0	---	0	---	2	0.47	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115.75	109.8	36.82	6.35
MEAN	0	0	0	0	0	0	0	0	3.86	3.54	1.19	0.21
AC-FT	0	0	0	0	0	0	0	0	230	218	73	13
MAX	0	0	0	0	0	0	0	0	9.4	7	2.3	0.45
MIN	0	0	0	0	0	0	0	0	0	2	0.47	0

CAL YR	2009	TOTAL	367.24	MEAN	1.01	MAX	10	MIN	0	AC-FT	728
WTR YR	2010	TOTAL	268.72	MEAN	0.74	MAX	9.4	MIN	0	AC-FT	533

MAX DISCH: 10.1 CFS AT 15:15 ON Jun. 17,2010 GH 1.34 FT. SHIFT 0.06 FT. (+0.02 FT GH CORR. APPLIED)
MAX GH: 1.34 FT. AT 15:15 ON Jun. 17,2010 (+0.02 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
Water Year 2010

Location.--	Lat. 39°54'07", Long. 105°38'44"; diverts water from tributaries of William's Fork River and main stem and tributaries of Fraser River in Colorado River basin, to South Boulder Creek, in sec. 2, T.2 S., R.74 W., in Platte River basin, Gilpin County.
Drainage and Period of Record.--	June 1936 to present.
Equipment.--	Graphic water stage recorder (weekly) and high data rate satellite telemetry (Sutron 8210 DCP with a Satlink 2 transmitter and a phone modem) in a timber shelter at a concrete stilling well and 15 foot Parshall Flume. The DCP experienced failure to log on April 26, 2010 and was replaced on April 27. The Sutron 8210 DCP and shaft encoder were replaced with a Stage Discharge Recorder and new Satlink 2 DCP. Flume is equipped with a staff. Primary reference is an electric tape gage. Gage has AC power and a heater is used to keep the well open in the winter.
Hydrologic Conditions.--	The flow is collected from transmountain diversions on Vasquez, Frazier-Jim, and Ranch Creeks in the Winter Park area, as well as some water imported from other drainages. Water is collected year-round and will show diurnal variations.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with chart backup. The record is complete and reliable, except for December 8-10, when there was possible ice in well (heater not activated for winter season.) Chart shows some movement and good record in December is mostly flat anyway. Record was used but the accuracy discounted. The stage discharge relationship generally does not become ice-affected as the water is still warm from the tunnel. The well, however, will freeze in extreme temperatures if heat lamp or space heater are not turned on or adjusted correctly. The DCP failed to log values on April 26 and 27. The missing data values were obtained from the chart without loss of accuracy. The chart is changed weekly by Denver Water Department, who has been asked to report on encoder errors. The primary data vs. chart max/min times did not always match, primarily due to inaccurate starting set points in both stage and time on the chart. However, the chart usually agreed within 0.02 ft in stage and/or 2 hours from primary data. Pen and time corrections were made when filling in missing satellite data. During June 11-23, the tunnel was shut down for maintenance and Denver reported zero flow. Residual GH's of 0.05 ft and less were recorded during this period. These residuals were either standing water in the well, or seepage that was not an active diversion. GH's of less than 0.05 ft were computed as zero flow.
Datum Corrections.--	Levels were last run on Jan 6 and August 16, 2006, gage read correctly both times.
Rating.--	Control is a standard 15 foot Parshall Flume. Get-away conditions are good; submergence of the control is not a problem. Moss historically builds during the fall and winter months. Eleven measurements (Nos. 624-634) were made this water year ranging in discharge between 7.13 and 110 cfs. STD15FTP, a standard 15-ft Parshall flume rating was used this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 15 ft Parshall Flume is 8 to 600 cfs. Anything above or below this range is outside the +/- 5% accuracy range unless defined by measurements. This flume has been further defined by measurements from 6.8 to 672 cfs. Daily flows did not exceed these limits in WY2010. The peak flow of 674 cfs occurred at 2120 May 27, 2010 at a gage height of 4.53 ft with a shift of 0.11 ft. It exceeded measurement no. 630, made May 21, 2010, by 3.06 ft in stage.
Discharge.--	Shifting control method was used all year. The flume is in good condition but negative shifts can be caused by rocks deposited in the approach canal and flume and by moss build-up in the flume. The approach canal was cleaned by Denver Water during a September 9-30, 2009 construction project which required flow to be off. The result of the clean out was better distribution of velocities across the flume. Higher flows come into the flume with substantial approach velocity, and with faster velocities and deeper depths on the gage side—this leads to positive shifts at higher flows. Special shift distributions are used when flume cleaning changes the shift and staff readings in the flume before and after cleanings. Measurements for this water year show unadjusted shifts varying from -0.04 to + 0.03 ft. Shifts were distributed by stage in WY 2010. All measurements made (Nos. 624-635) were incorporated in a single variable stage-shift relationship, MOFTUNCOVST01, which was applied all year. All measurements were given full weight, except for Measurement 633, which was adjusted 2% to fit the table. Higher flows were defined by adding Measurement No. 619, from WY2009 to the table. No. 619 showed an unadjusted shift of 0.21 ft, which had been adjusted to 0.11 ft in 2009, based on comparison to other measurements in this range. Measurement 624 (Oct 20, 2009) was not adjusted for WY 2010. It was, however, used with a 1% adjustment in the 2009 record. The unadjusted shift was judged better due to confirmation by measurement No. 631 from 2010.
Special Computations.--	Computed discharge record was used, not estimated, for December 8-10 when there was possible ice in the well. The accuracy is considered fair since flow was relatively constant in December both before and after the suspected days.
Remarks.--	Record is good, except for days of possible ice affect, December 8-10, which are fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	The bottom of flume should be cleaned on a regular basis. Steps should be installed into the side of the canal above the flume. A non-standard rating for the flume is possible at the high and low ends if enough measurements can be made.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09022500 MOFFAT WATER TUNNEL AT EAST PORTAL

RATING TABLE--

STD15FTPf USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

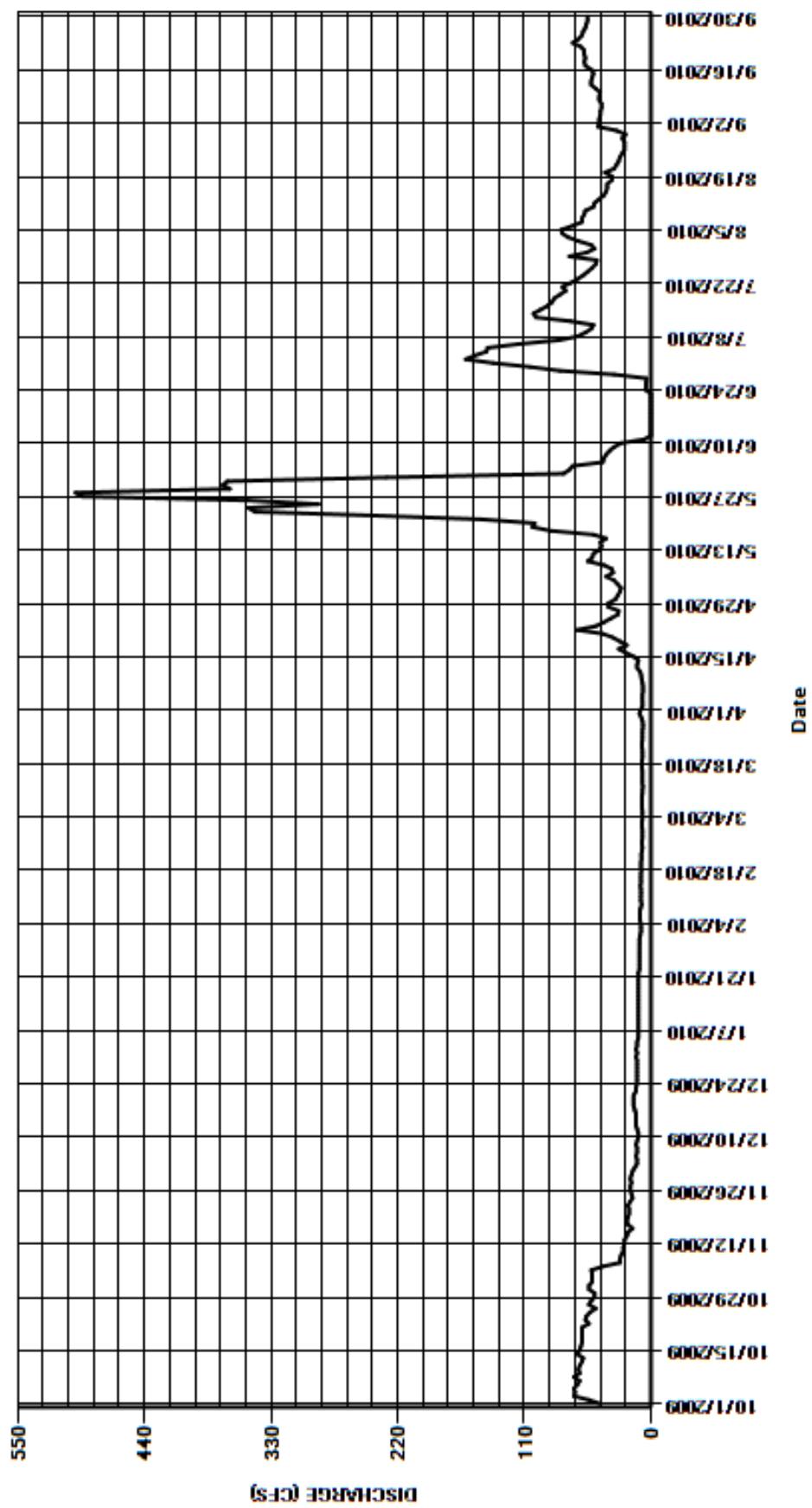
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	54	16	12	9.3	7.7	9.1	29	230	137	52	46
2	54	51	14	13	8.6	7.8	7.3	27	76	161	63	45
3	67	51	12	12	8.7	7.7	7.3	26	71	153	72	45
4	66	51	12	12	9.1	7.5	7.6	29	68	143	77	44
5	67	52	13	11	9.5	7.5	7.4	32	42	142	78	44
6	64	42	12	11	9.4	7.7	7	39	41	115	68	43
7	62	27	12	11	9.7	7.9	7	33	39	80	60	43
8	67	27	13	11	9.1	8.1	7.3	34	36	64	60	45
9	62	26	12	11	8.1	7.9	8.1	41	32	57	58	45
10	63	24	11	11	8.9	7.6	8.6	55	26	52	57	44
11	62	24	11	11	8.9	7.3	9.3	51	5.6	50	50	48
12	60	23	12	11	8.6	7.1	12	50	0	70	49	52
13	59	23	13	11	8.9	7.6	12	45	0	100	45	52
14	64	21	13	11	9.1	7.7	11	43	0	102	41	51
15	62	20	13	11	8.7	7.6	15	44	0	96	39	50
16	61	16	13	11	8.9	7.6	22	39	0	90	38	52
17	60	20	14	11	8.7	7.9	28	50	0	86	38	57
18	60	21	15	11	8.4	8	21	87	0	84	34	58
19	60	20	15	11	8.6	7.7	27	103	0	79	34	57
20	60	19	15	11	8.6	7.2	33	101	0	74	40	58
21	60	19	15	11	8.3	7.4	42	147	0	77	32	58
22	54	20	13	11	8.5	7.7	64	240	0	70	30	61
23	57	18	13	10	7.8	7.9	48	344	0	64	28	68
24	56	16	12	10	7.5	7.6	41	350	4.8	59	27	63
25	53	17	12	10	8	7.4	35	289	4.4	55	25	60
26	48	18	12	10	7.7	7.4	29	350	4.2	51	23	59
27	54	18	12	10	7.5	7.2	28	494	4	48	23	57
28	52	17	12	10	7.6	7	37	500	32	47	23	56
29	49	18	12	10	---	7.3	37	366	79	71	25	55
30	49	17	12	9.8	---	8.4	31	372	105	56	22	55
31	54	---	13	10	---	10	---	368	---	49	30	---
TOTAL	1810	790	399	336.8	240.7	238.4	659.0	4778	900.00	2582	1341	1571
MEAN	58.4	26.3	12.9	10.9	8.6	7.69	22	154	30	83.3	43.3	52.4
AC-FT	3590	1570	791	668	477	473	1310	9480	1790	5120	2660	3120
MAX	67	54	16	13	9.7	10	64	500	230	161	78	68
MIN	44	16	11	9.8	7.5	7	7	26	0	47	22	43
CAL YR	2009	TOTAL	22771.20	MEAN	62.4	MAX	714	MIN	0	AC-FT	45170	
WTR YR	2010	TOTAL	15645.90	MEAN	42.9	MAX	500	MIN	0	AC-FT	31030	

MAX DISCH: 674 CFS AT 21:20 ON May. 27,2010 GH 4.53 FT. SHIFT 0.11 FT.

MAX GH: 4.53 FT. AT 21:20 ON May. 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW
Water Year 2010

Location.--	Lat 40°19'40", long 105°34'39", in NW 1/4 sec. 9, T.3 N., R.75 W., Larimer County on right bank at upstream end of Aspen Creek Siphon, 700 ft. below east portal, and 4.5 mi. southwest of Estes Park. Alva B, Adam's Tunnel At East Portal is a transbasin diversion conveying waters tributary to the Colorado River to the Big Thompson basin which can be further conveyed to the Cache La Poudre, Boulder Creek and South Platte River drainages.
Drainage and Period of Record.--	ADANETCO (West Slope Water only) published since 2000. Adams Tunnel (ADATUNCO) published since 1948, includes small amounts of east slope water that enter the ADATUNCO stilling basin.
Equipment.--	Alva B. Adam's Net (ADANETCO) is a computed record. This record is comprised of data obtained from Alva B. Adam's Tunnel Near Estes Park, CO (ADATUNCO), Wind River Near Estes Park, CO (WINDESCO) and Wind River Bypass Below Adam's Tunnel Near Estes Park, CO (WINBYPSCO). See individual records for individual station equipment.
Hydrologic Conditions.--	Alva B. Adam's Tunnel is a transmountain water diversion operated by the United States Bureau of Reclamation (USBR) as a component of the Colorado Big Thompson Project (C-BT). Water is captured through various structures and reservoirs on the west slope and transported to the east slope via Adam's Tunnel. The tunnel empties into a stilling reservoir before entering the ADATUNCO flume. This stilling reservoir can intercept native east slope flow from Wind River for power generation throughout the C-BT system via an operation called "skimming"; or the Wind River flow can be bypassed under the stilling reservoir. Wind River is gaged upstream of the reservoir at WINDESCO and again below ADATUNCO at the WINBYPSCO gage. Wind River water is skimmed into the C-BT system during peak runoff periods of the summer when Wind River flows are in excess of 2 cfs. Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINBYPSCO). Skimming operations of Wind River occurred from 1245 May 17, 2010 through 1000 July 26, 2010. USBR accounting indicates that skim operations ended on July 22, 2010; however, this date does not correspond to a USBR visits to the site. Additionally, computed WINDESCO vs. WINBYPSCO records indicate skim operations were still occurring. A USBR visit was made on July 26, 2010 at which time the WINDESCO and WINBYPSCO computed records begin to match well. Therefore, it is suspected that skim operations actually ended on July 26, 2010.
Gage-Height Record.--	Computed record. See gage-height record comments for individual gages. The peak gage-height, as recorded by ADATUNCO of 4.16 feet occurred 0945 September 10, 2010 while skimming operations were not actively occurring.
Datum Corrections.--	Computed record. See individual gage station analyses.
Rating.--	Computed record. See individual gage station analyses.
Discharge.--	Computed record. See special computations section for discharge computations. The computed peak discharge of 566 cfs occurred at 0945 September 10, 2010 at a gage height of 4.16 ft with a shift of 0.00 ft. The peak did not occur during skimming operations. As such, the peak computed discharge recorded at the ADATUNCO gage will equal the computed peak discharge for this record.
Special Computations.--	Discharge, for the ADANETCO gage is determined by calculating the amount of skimmed Wind River water moved through the ADATUNCO structure, then subtracting that amount from the ADATUNCO record on days when skimming occurred. Thus, $\text{ADANETCO} = \text{ADATUNCO} - (\text{WINDESCO} - \text{WINBYPSCO}).$
Remarks.--	Skimming operations occurred from 1245 May 17, 2010 through 1000 July 26, 2010. This is a computed record. During the skimming operation a total of 849.6 acre feet of water was diverted into the C-BT system from Wind River for power generation purposes. The majority of flow in this computed record is through the ADATUNCO structure. The ADANETCO record is rated as per ADATUNCO: "The record is good, except for the May 9-26, 2010 algal growth / flume cleaning correction period. The record for this period is rated fair since the point of rapid algal growth and affect thereof cannot be fully substantiated. Zero flow is determined operationally". Computed ADANETCO values from June 4-24, 2010 are unrealistically low. It is assumed that the computed values through this period do not represent active diversion of waters through the tunnel. Rather, it is suspected that these computed values represent in part or in aggregate: residual water draining through the tunnel, minimal leakage from the West Slope diversion works, accretions to the tunnel and computational errors in the skim computation process. Regardless of the cause these values are considered attributable to the Colorado River Basin. Individual stations maintained by and records developed by Russell V. Stroud.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

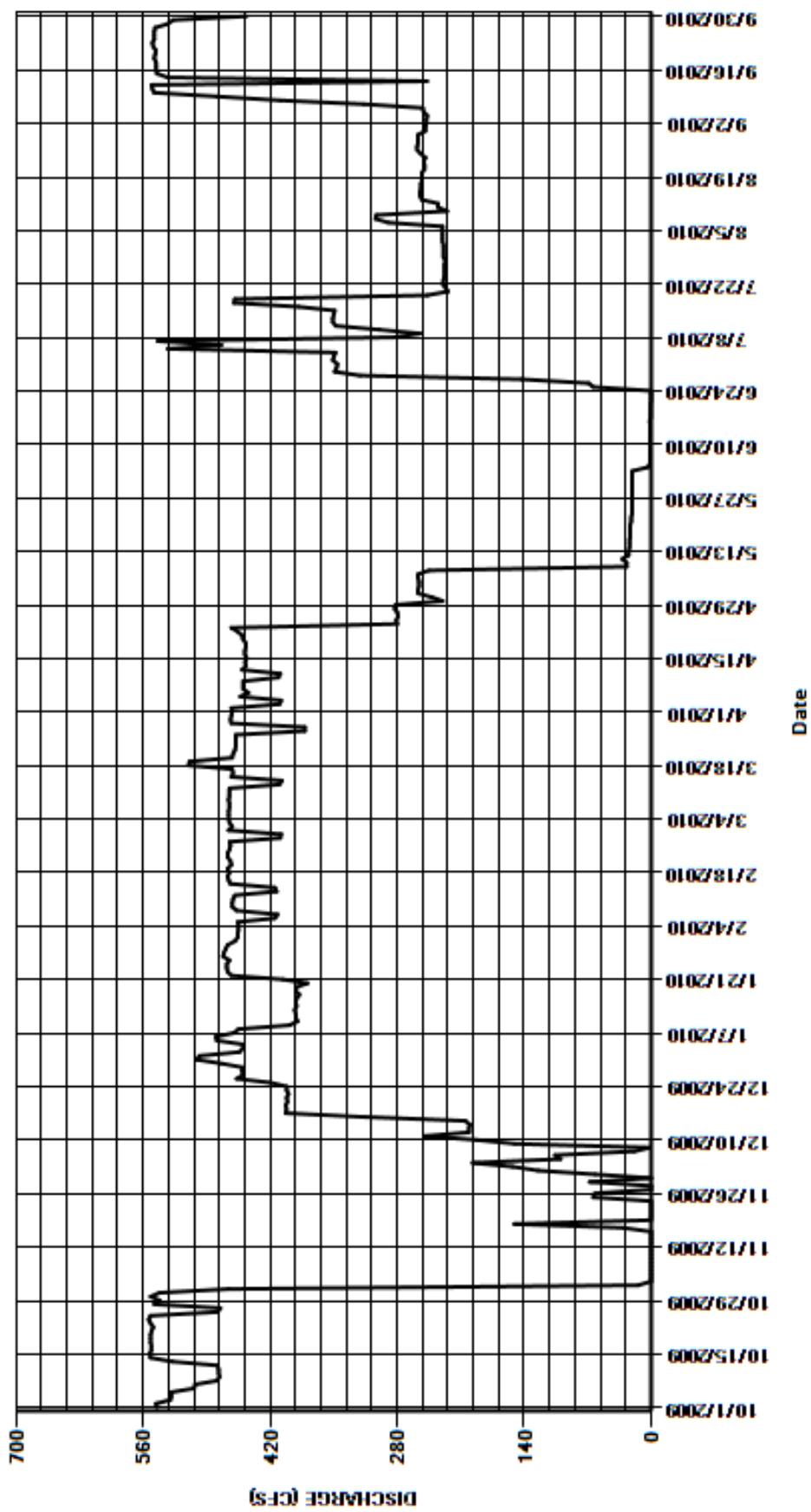
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	545	466	62	498	456	466	462	242	21	346	229	249
2	546	14	125	454	456	462	463	257	21	351	230	248
3	530	0	153	450	455	465	410	257	21	350	230	248
4	529	0	197	450	455	466	408	256	3.7	348	230	247
5	529	0	100	479	456	466	453	256	1.2	533	230	251
6	504	0	106	480	415	466	444	257	1.2	474	230	252
7	503	0	19	460	412	465	450	257	1.1	544	290	317
8	479	0	1	455	457	465	450	245	1.1	283	304	409
9	476	0	151	399	462	466	450	27	0.97	255	303	479
10	477	0	193	390	462	465	411	27	0.97	300	225	548
11	477	0	250	392	461	465	409	32	0.98	348	235	550
12	478	0	201	392	459	465	451	25	1.2	351	235	551
13	528	0	201	393	413	410	447	25	1.2	351	253	247
14	552	0	200	391	415	407	448	24	1.1	350	255	533
15	553	0	205	392	464	463	446	24	1.1	349	255	545
16	551	0	316	391	466	461	448	24	1.7	389	254	546
17	551	31	403	388	467	462	448	23	0.59	460	254	546
18	552	151	402	392	465	510	447	23	0.52	459	253	546
19	552	0.25	403	391	467	509	447	23	0.44	247	253	548
20	552	0	401	379	463	462	450	23	0.33	224	253	547
21	551	0	402	406	464	461	451	22	0.31	227	250	546
22	549	0	400	463	467	459	456	22	0.17	230	250	549
23	552	0	402	467	467	458	463	21	0.09	229	251	550
24	554	0	402	468	465	458	280	21	0.19	228	249	548
25	552	64	420	468	464	458	281	21	64	228	254	548
26	478	62	457	465	465	458	279	21	69	228	258	548
27	475	0	450	472	409	382	280	21	143	228	258	547
28	548	0	451	471	408	382	283	21	321	227	257	533
29	542	68	451	469	---	463	282	21	349	229	257	527
30	552	0	474	467	---	464	230	21	347	229	257	446
31	542	---	501	459	---	463	---	21	---	229	249	---
TOTAL	16359	856.25	8899.0	13491	12635	14172	12127	2560	1376.16	9824	7791	13749
MEAN	528	28.5	287	435	451	457	404	82.6	45.9	317	251	458
AC-FT	32450	1700	17650	26760	25060	28110	24050	5080	2730	19490	15450	27270
MAX	554	466	501	498	467	510	463	257	349	544	304	551
MIN	475	0	1	379	408	382	230	21	0.09	224	225	247
CAL YR	2009	TOTAL	119370.45	MEAN	327	MAX	557	MIN	0	AC-FT	236800	
WTR YR	2010	TOTAL	113839.41	MEAN	312	MAX	554	MIN	0	AC-FT	225800	

MAX DISCH: 566 CFS AT 09:45 ON Sep. 10,2010 GH 4.16 FT. SHIFT 0 FT.

MAX GH: 4.16 FT. AT 09:45 ON Sep. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ADAMS TUNNEL AT EAST PORTAL - COMPUTED FLOW
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

Water Year 2010

Location.-- Lat 40°28'22", long 105°49'17", in NW $\frac{1}{4}$ sec. 21, T.6 N., R.75 W., in Platte River Basin, to La Poudre Pass Creek, tributary to Cache La Poudre River.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water stage recorder, shaft encoder and Satlink 2 DCP in a wooden shelter and well at a 10 foot Parshall flume. A drop tape is the primary reference. There is a staff in the stilling well but it is not accurate.

Hydrologic Conditions.-- The snow-pack in this area was higher than average this water year. This year June 12 – 23, 2010 Long Draw reservoir filled and 'Active' Diversions were discontinued.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart backup. The record is complete and reliable, except for October 22 - 27, 2009, when the stage discharge relationship was possibly affected by ice; and, May 10 – June 1, 2010, when there was no GH record due to the well being frozen even though there was flow through the flume.

Datum Corrections.-- Levels were last run on July 7, 2009.

Rating.-- The control is a 10-foot concrete Parshall flume. A standard 10-ft Parshall rating, STD10FTPF, is used. No conditions have been documented which adversely affect flume operation. One measurement, No. 64, was made this year at 41.8 cfs. The peak flow of 315 cfs occurred at 1945 June 6, 2010 at a gage height of 3.67 ft with a zero shift.

Discharge.-- Shifts have historically been adjusted to zero. The trend has been for a slight negative shift. This year's measurement required a 3% shift adjustment to zero. Discharge for the ice days were estimated by the water commissioner. The deputy commissioner changes the weekly chart and is in regular communication with the ditch operators who live up there during the diversion season.

Special Computations.-- None .

Remarks.-- The record is good except for the ice affected days of October 22 - 27, 2009 and May 10 – June 1, 2010 which are estimated and poor. This is a seasonal diversion and does not operate in the winter. Station maintained and record developed by Lee Cunning.

Recommendations.-- Levels should be run in WY2011 and the RP should be checked against the average crest elevation to verify it and the tape length. Additional reference marks should be established independent of flume structure. A measurement bridge over the flume in front of the gage house should be built. The chart recorder float is hanging up on something as it rises above GH= 2.90 ft. The obstruction should be removed or the recorder repositioned.

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09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPFEKP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	0	0	0	0	0	0	0	100	161	29	6.2
2	4.9	0	0	0	0	0	0	0	91	173	30	5.9
3	4.7	0	0	0	0	0	0	0	83	157	28	5.6
4	4	0	0	0	0	0	0	0	172	134	28	5.2
5	3.5	0	0	0	0	0	0	0	236	114	30	4.9
6	4	0	0	0	0	0	0	0	252	98	29	4.9
7	4.1	0	0	0	0	0	0	0	230	92	26	4.7
8	3.6	0	0	0	0	0	0	0	177	119	24	5
9	2.6	0	0	0	0	0	0	0	143	92	22	5.4
10	2.7	0	0	0	0	0	0	1	146	84	20	4.5
11	2.7	0	0	0	0	0	0	1	132	80	18	4.3
12	3.1	0	0	0	0	0	0	1	137	75	20	3.9
13	4.5	0	0	0	0	0	0	1	91	74	19	3.8
14	3.1	0	0	0	0	0	0	1	58	73	16	3.5
15	2.3	0	0	0	0	0	0	2	50	67	15	3.3
16	1.6	0	0	0	0	0	0	4	55	59	16	3.1
17	1.3	0	0	0	0	0	0	4	59	52	15	3
18	1.6	0	0	0	0	0	0	4	59	49	13	2.9
19	1.6	0	0	0	0	0	0	5	61	47	13	2.7
20	0.45	0	0	0	0	0	0	6	62	44	14	2.7
21	0.34	0	0	0	0	0	0	8	58	47	12	2.8
22	0.15	0	0	0	0	0	0	5	54	50	11	3
23	0.23	0	0	0	0	0	0	5	102	48	10	4.7
24	0.15	0	0	0	0	0	0	5	160	41	9.6	3.7
25	0.15	0	0	0	0	0	0	5	163	38	9	3.2
26	0.15	0	0	0	0	0	0	8	193	35	8.4	2.9
27	0.15	0	0	0	0	0	0	10	176	32	8	2.7
28	0	0	0	0	0	0	0	45	170	35	7.8	2.6
29	0	0	0	0	---	0	0	50	170	33	7.6	2.4
30	0	0	0	0	---	0	0	60	160	36	7	2.3
31	0	---	0	0	---	0	---	75	---	31	6.6	---
TOTAL	60.97	0.00	0.00	0.00	0.00	0.00	0.00	306.00	3800	2270	522.0	115.8
MEAN	1.97	0	0	0	0	0	0	9.87	127	73.2	16.8	3.86
AC-FT	121	0	0	0	0	0	0	607	7540	4500	1040	230
MAX	4.9	0	0	0	0	0	0	75	252	173	30	6.2
MIN	0	0	0	0	0	0	0	0	50	31	6.6	2.3

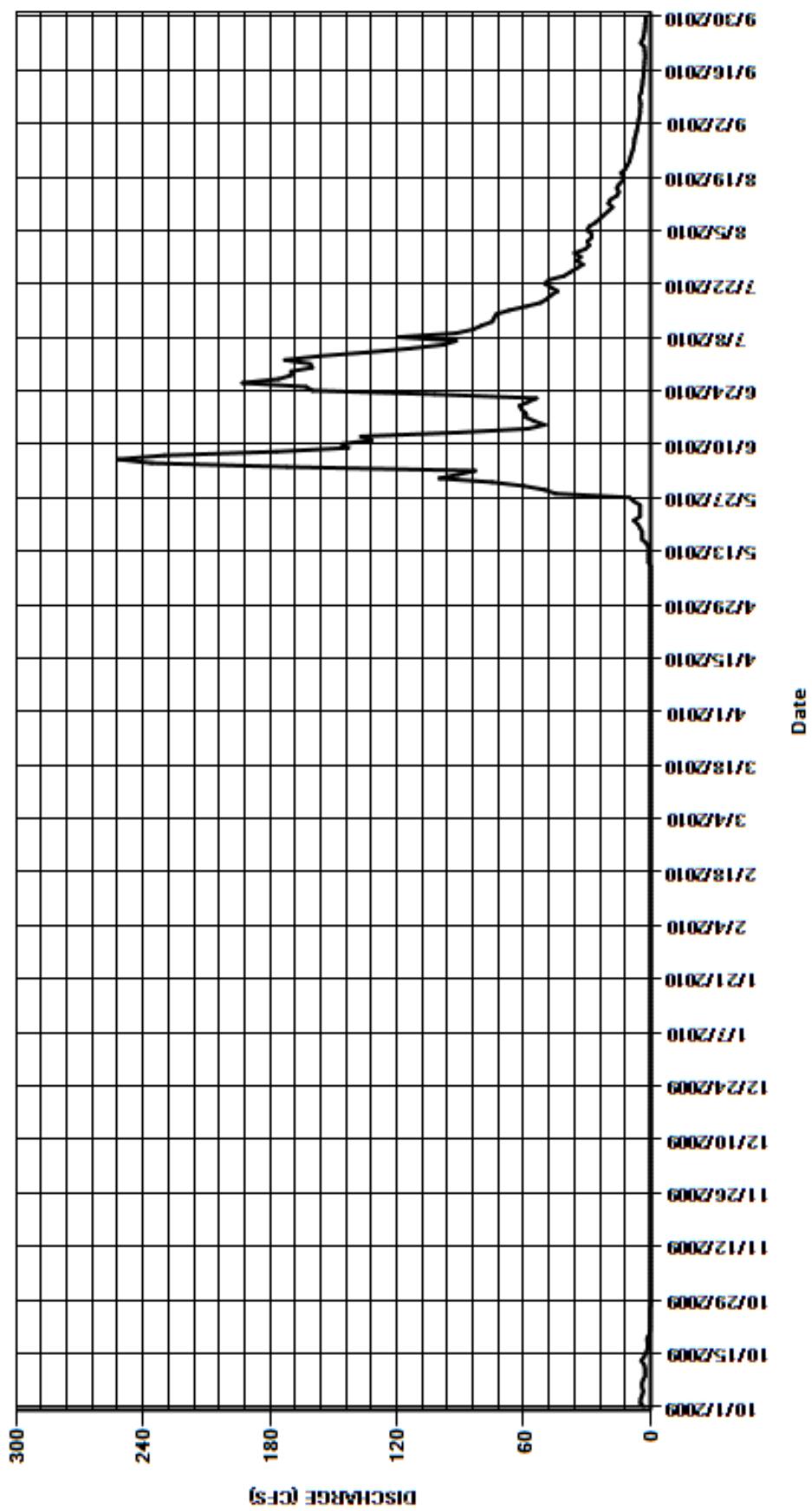
CAL YR	2009	TOTAL	9789.96	MEAN	26.8	MAX	238	MIN	0	AC-FT	19420
WTR YR	2010	TOTAL	7074.77	MEAN	19.4	MAX	252	MIN	0	AC-FT	14030

MAX DISCH: 315 CFS AT 19:45 ON Jun. 06,2010 GH 3.67 FT. SHIFT 0 FT.

MAX GH: 3.67 FT. AT 19:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09010000 GRAND RIVER DITCH AT LAPOUDRE PASS @ 10 FT MARSHALL FLUME
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
CAMERON PASS DITCH NEAR CAMERON PASS
Water Year 2010

Location.-- Lat 40°31'14", long 105°53'32"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache La Poudre River) in sec. 2, T.6 N., R.76 W.

Drainage and Period of Record.-- N/A.

Equipment.-- Stage Discharge Recorder (SDR) in a wooden shelter at a 2 foot Parshall flume with staff gage inside the stilling well.

Hydrologic Conditions.-- Average snow-pack this year produced flows that were close to normal. What is diverted and measured at this gage is related to how soon the ditch is started. No water was diverted in WY2010. In WY2009 the ditch started on June 2nd and diverted 187 acre-feet.

Gage-Height Record.-- No water was diverted in WY2010. No record. SDR recorder was not installed .

Datum Corrections.-- Levels were last run August 20, 2009. The staff was found to be reading 0.02 ft low. A +0.02 ft datum correction was made in WY2009.

Rating.-- A standard 2 ft. Parshall rating is used. Rating has been verified to 5.76 cfs.

Discharge.-- None.

Special Computations.-- None.

Remarks.-- Record is good. No water was run during WY2010. Station maintained and record developed by Lee Cunning.

Recommendations.-- Make two measurements at higher and lower ranges. Re-Install current staff inside well so it may be read correctly.

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CAMERON PASS DITCH NEAR CAMERON PASS

RATING TABLE--

STD02FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

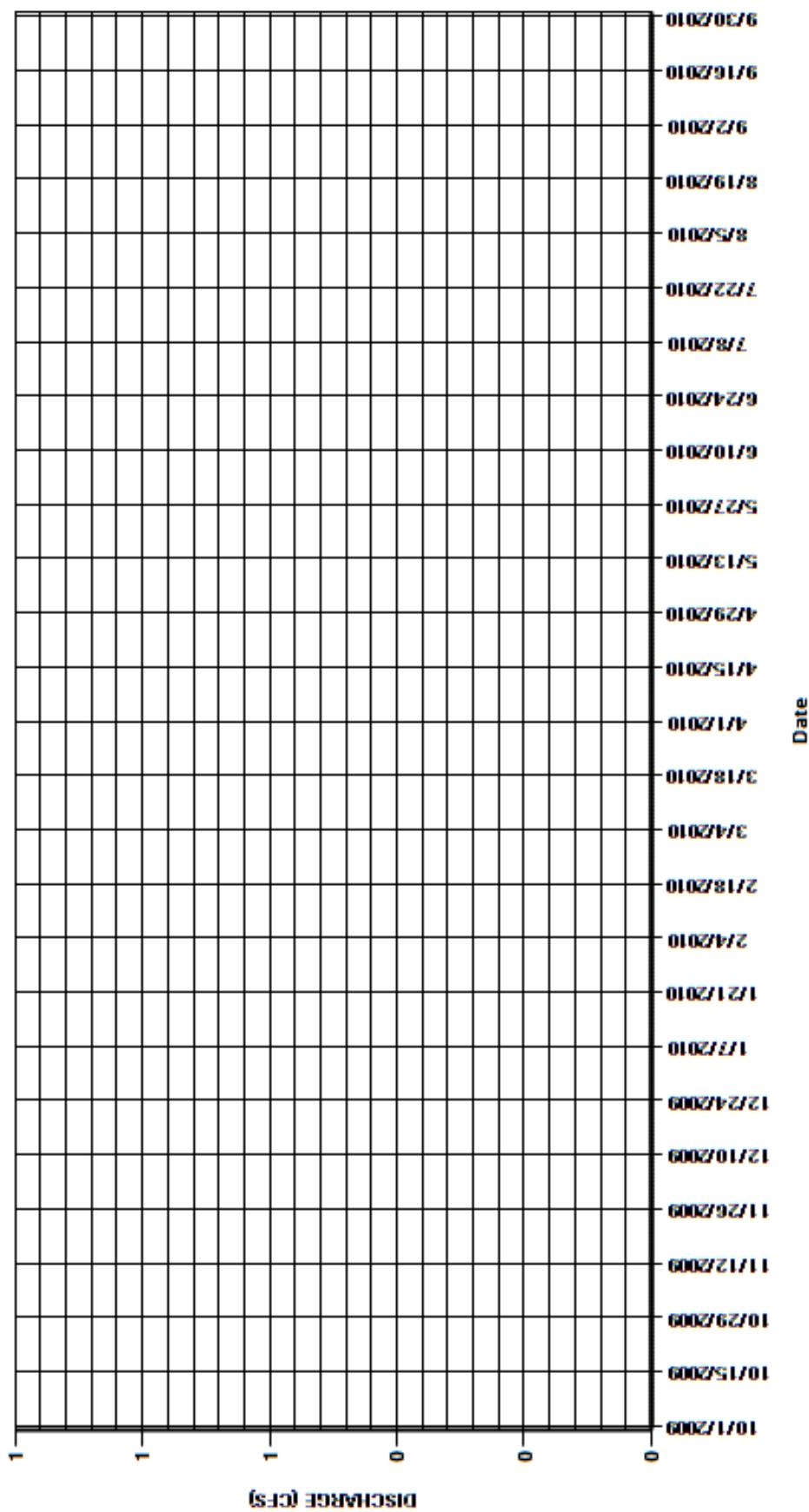
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	100.59	MEAN	0.28	MAX	6	MIN	0	AC-FT	200
WTR YR	2010	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0

MAX DISCH: (NO WATER RUN THIS WATER YEAR)
MAX GH: FT. (NO WATER RUN THIS WATER YEAR)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CAMERON PASS DITCH NEAR CAMERON PASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06746000 MICHIGAN DITCH AT CAMERON PASS
Water Year 2010

Location.--	Lat. 40°31'14", Long. 105°53'30"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache la Poudre River) in sec. 2, T.6 N., R. 76 W.
Drainage and Period of Record.--	N/A.
Equipment.--	Satellite monitoring equipment and weekly graphic water-stage recorder in a log shelter with a PVC well at 8 foot Parshall flume. An inside electric tape to the stilling well serves as the primary reference gage. The structure also has a 0.75-foot or 9-inch Parshall that sits side by side with the 8-foot flume. This allows winter and low flows (flows below about 4.5 cfs) to be measured. Two rating tables are used. The crest height for both flumes is tied to a single electric tape, as both flumes share a common stilling well. The shelter is heated by propane so that the flume and well are free of ice. City of Fort Collins personnel put sections of halved 2 foot culverts in the ditch below the flume to stop the back water conditions experienced in the past.
Hydrologic Conditions.--	Transmountain diversion. Last water year 5,950 acre-feet were diverted. In 2002, less than 1,500 acre-feet were diverted. 3,630 acre-feet were diverted this water year.
Gage-Height Record.--	Primary record is hourly averages of 15 minute data taken from satellite monitoring with chart backup. Encoder calibration was supported by weekly visits. The record is complete and reliable except for the following days: October 1-2, 6-7, 2009, when the flume was ice affected. May 18-25, 2010, when there was backwater from melting ice/snow below the gage. On transition days May 26 and September 14, when the flow was switched from one flume to the other, each had a few hours estimated during the transition due to the flume work involved and the need for a complete hour of record to make calculations for each rating. This was done without loss of accuracy for the daily discharges. No diversion occurred from October 13 to November 11 due to replacement of the Highway 14 culvert. Residual GH's observed in the flume during this period represent either standing water backed up from the construction or seepage flows which were removed from the ditch between the gage and the highway.
Datum Corrections.--	Levels were run for the first time on August 24, 2010. The two flume crests were found to be 0.03 ft different in elevation. However, the common RP was set to an elevation between the two crests, so that the tape length agreed to within +/- 0.02 ft. with the crest of both flumes. A secondary reference mark, RM 3, a bolt in the top of the upstream right wing-wall was established.
Rating.--	The control is either an 8-foot Parshall flume with a standard rating, or, the winter (low) flow control is a 9-inch Parshall flume with standard rating. Periods of record with the two controls during WY2010 are: October 1, 2009-1200 May 26, 2010--9 inch Parshall; 1300 May 26-1200 September 14, 2010--8 foot Parshall; 1300 September 14-September 30, 2010-9 inch Parshall. At this point there are no sources of shift other than movement of the flume crests and this has not been observed. One measurement (No. 38) was made this water year while flow was through the 8 ft Parshall flume. The peak flow of 37.3 cfs occurred at 1630 June 6, 2010 at a gage height of 1.10 ft with a zero shift while flow was through the 8 ft Parshall Flume.
Discharge.--	Shifting control method was used. Msmt 38 was discounted to a 0.00 ft shift. A zero shift was applied all year.
Special Computations.--	Discharge estimates for ice affected days: October 1-2, 6-7, 2009, were made using adjacent good record. Computed record was considered estimated for May 18-25, 2010, when downstream ice caused backwater in the flume. GH corrections were used for several periods when ice effects were noted or could be inferred from the GH graph. The maximum GH for the water year (2.31 ft at 14:00 May 25, 2010) was recorded during the period when the 9 in flume was in use and experienced backwater due to ice.
Remarks.--	The record is considered good, except for the following days which were estimated and poor due to ice: October 1-2, 6-7, 2009; May 18-25, 2010. No diversion took place from October 13 to November 11, 2009 due to replacement of the ditch culvert under Colorado Highway 14. Station maintained and record developed by Lee Cunning.
Recommendations.--	Transition from the 8 ft to the 9 in. flume in the fall should be observed and a pygmy meter measurement should be made in the 8 ft. flume just prior to the switch. The height of the boards placed in front of the 8 ft. flume should be documented. If flows above a GH of 2.00 ft are possible in the 9 in flume, the rating will need to be verified.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06746000 MICHIGAN DITCH AT CAMERON PASS

RATING TABLE--

STD09INPF USED FROM 01-Oct-2009 TO 26-May-2010
 STD08FTPFEEXP USED FROM 26-May-2010 TO 14-Sep-2010
 STD09INPF USED FROM 14-Sep-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

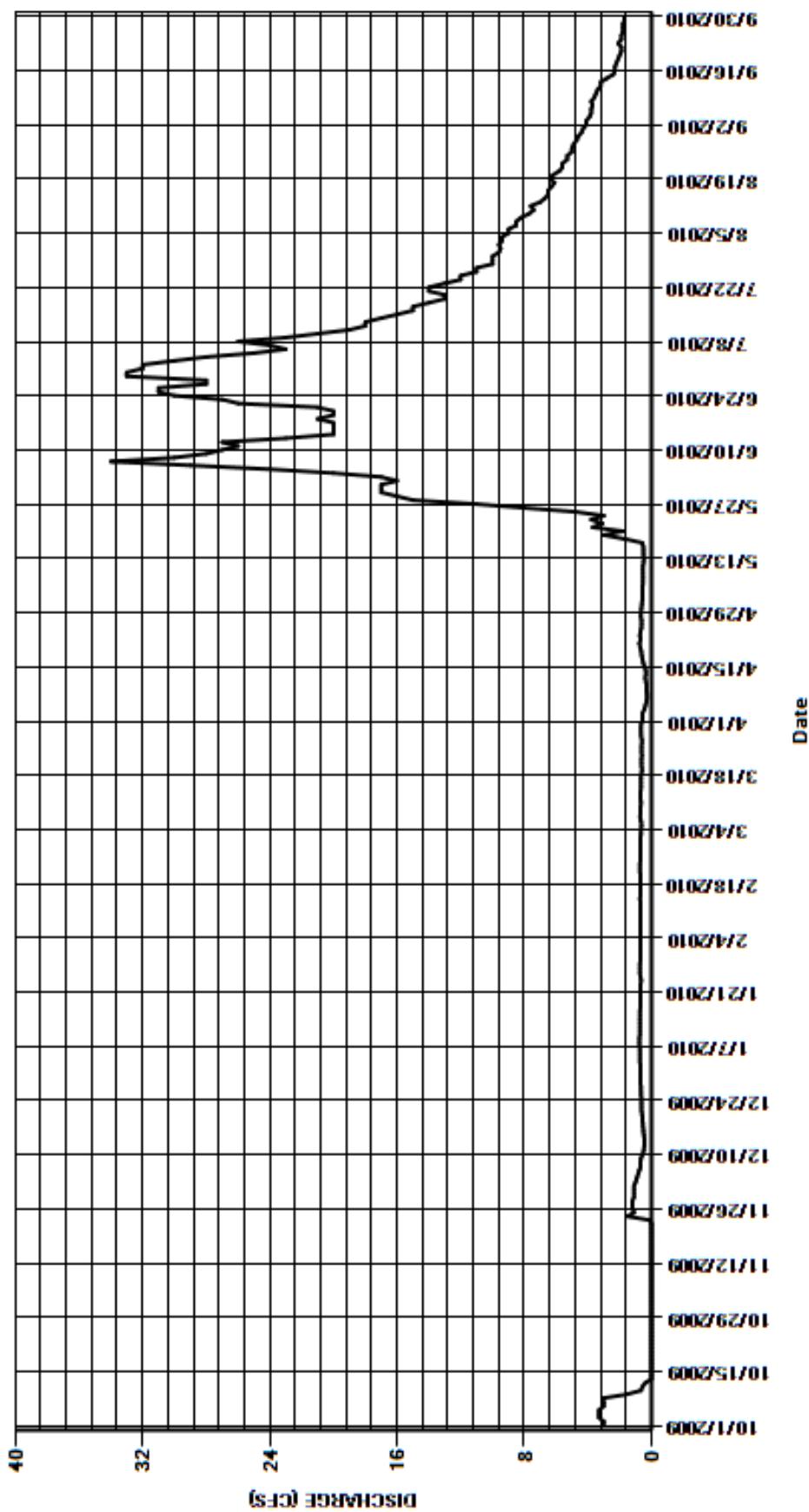
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3	0	1.1	0.7	0.7	0.7	0.57	0.61	17	32	9.5	4.3
2	3	0	1.1	0.7	0.7	0.69	0.57	0.59	16	32	9.6	4.1
3	3.3	0	0.99	0.73	0.69	0.67	0.56	0.57	17	30	9.4	4.1
4	3.3	0	0.92	0.73	0.7	0.66	0.45	0.56	20	28	9.4	3.9
5	3.3	0	0.84	0.73	0.7	0.64	0.38	0.56	24	25	9	3.8
6	3	0	0.76	0.74	0.7	0.66	0.32	0.56	29	23	9	3.8
7	3	0	0.68	0.75	0.7	0.72	0.29	0.55	34	24	8.5	3.7
8	3.1	0	0.7	0.76	0.69	0.71	0.3	0.54	30	26	8.5	3.8
9	1.6	0	0.67	0.76	0.7	0.69	0.32	0.55	28	23	8.2	3.6
10	0.67	0	0.56	0.73	0.69	0.68	0.31	0.56	27	21	7.7	3.5
11	0.57	0	0.49	0.73	0.7	0.67	0.35	0.54	26	19	7.4	3.4
12	0.39	0	0.46	0.73	0.69	0.7	0.39	0.5	27	18	7.6	3.2
13	0	0	0.45	0.73	0.7	0.7	0.36	0.49	23	18	7	3.2
14	0	0	0.45	0.73	0.72	0.68	0.36	0.5	20	17	6.7	2.8
15	0	0	0.48	0.72	0.71	0.66	0.45	0.51	20	16	6.5	2.4
16	0	0	0.51	0.72	0.71	0.66	0.52	0.52	20	15	6.5	2.3
17	0	0	0.53	0.71	0.7	0.67	0.58	0.59	20	15	6.3	2.3
18	0	0	0.55	0.71	0.7	0.66	0.62	1.7	21	14	6.1	2.2
19	0	0	0.58	0.7	0.71	0.61	0.65	3	20	13	6.4	2.1
20	0	0	0.59	0.69	0.7	0.62	0.72	1.8	20	13	6.2	2
21	0	0	0.62	0.7	0.72	0.63	0.76	3.7	21	14	5.8	1.9
22	0	0	0.63	0.7	0.72	0.64	0.69	3.1	26	14	5.6	1.9
23	0	0.08	0.64	0.69	0.72	0.61	0.73	3.8	27	13	5.6	2.1
24	0	1.5	0.64	0.65	0.71	0.63	0.7	3	30	12	5.3	1.9
25	0	1.1	0.65	0.71	0.71	0.62	0.64	4.8	31	12	5.3	1.9
26	0	1.2	0.65	0.73	0.71	0.62	0.62	8	31	11	5	1.8
27	0	1.2	0.67	0.73	0.71	0.61	0.63	11	28	11	5	1.8
28	0	1.2	0.68	0.73	0.7	0.65	0.68	15	28	10	4.9	1.8
29	0	1.1	0.69	0.71	---	0.65	0.67	16	33	10	4.7	1.7
30	0	1.1	0.7	0.71	---	0.66	0.64	17	33	10	4.6	1.7
31	0	---	0.7	0.7	---	0.66	---	17	---	9.6	4.4	---
TOTAL	28.23	8.48	20.68	22.26	19.71	20.43	15.83	118.20	747	548.6	211.7	83.0
MEAN	0.91	0.28	0.67	0.72	0.7	0.66	0.53	3.81	24.9	17.7	6.83	2.77
AC-FT	56	17	41	44	39	41	31	234	1480	1090	420	165
MAX	3.3	1.5	1.1	0.76	0.72	0.72	0.76	17	34	32	9.6	4.3
MIN	0	0	0.45	0.65	0.69	0.61	0.29	0.49	16	9.6	4.4	1.7

CAL YR	2009	TOTAL	2888.15	MEAN	7.91	MAX	62	MIN	0	AC-FT	5730
WTR YR	2010	TOTAL	1844.12	MEAN	5.05	MAX	34	MIN	0	AC-FT	3660

MAX DISCH: 37.8 CFS AT 16:30 ON Jun. 06,2010 GH 1.11 FT. SHIFT 0 FT.
 MAX GH: 2.31 FT. AT 14:00 ON May. 25,2010 (ICE AFFECTED, FLOW IN 9-INCH PARSHALL FLUME)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746000 MICHIGAN DITCH AT CAMERON PASS
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06746500 SKYLINE DITCH AT CHAMBERS LAKE
Water Year 2010

Location.-- Lat 40°39'50", long 105°53'10" Diverts water from West Branch Laramie River to Chambers Lake (tributary to Cache la Poudre River) in sec. 31, T.8 N., R.75 W.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water-stage recorder in a wooden shelter at a 10-foot Parshall flume. A drop tape from a reference point on the instrument shelf is the primary reference gage.

Hydrologic Conditions.--

Gage-Height Record.-- The primary record is mean daily gage heights taken from the chart recorder. This is the only source. The charts are worked by the District 3 water commissioner and checked by hydrographer. There was no water run this water year.

Datum Corrections.-- Drop tape length and RP elevation are tied to the average crest elevation of the flume. Levels were last run on June 6, 2000 and verified the correct tape length/RP elevation of 8.15 feet.

Rating.-- A standard Parshall flume rating STD10FTPF is used. There was no water run this water year.

Discharge.-- Shifts have been zero or adjusted to zero in the past.

Special Computations.--

Remarks.-- Record is good. Record developed by Lee Cunning.

Recommendations.-- Levels to RP and flume staff gage should be run in WY11.

STATE OF COLORADO
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06746500 SKYLINE DITCH AT CHAMBERS LAKE

RATING TABLE-- STD10FTP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

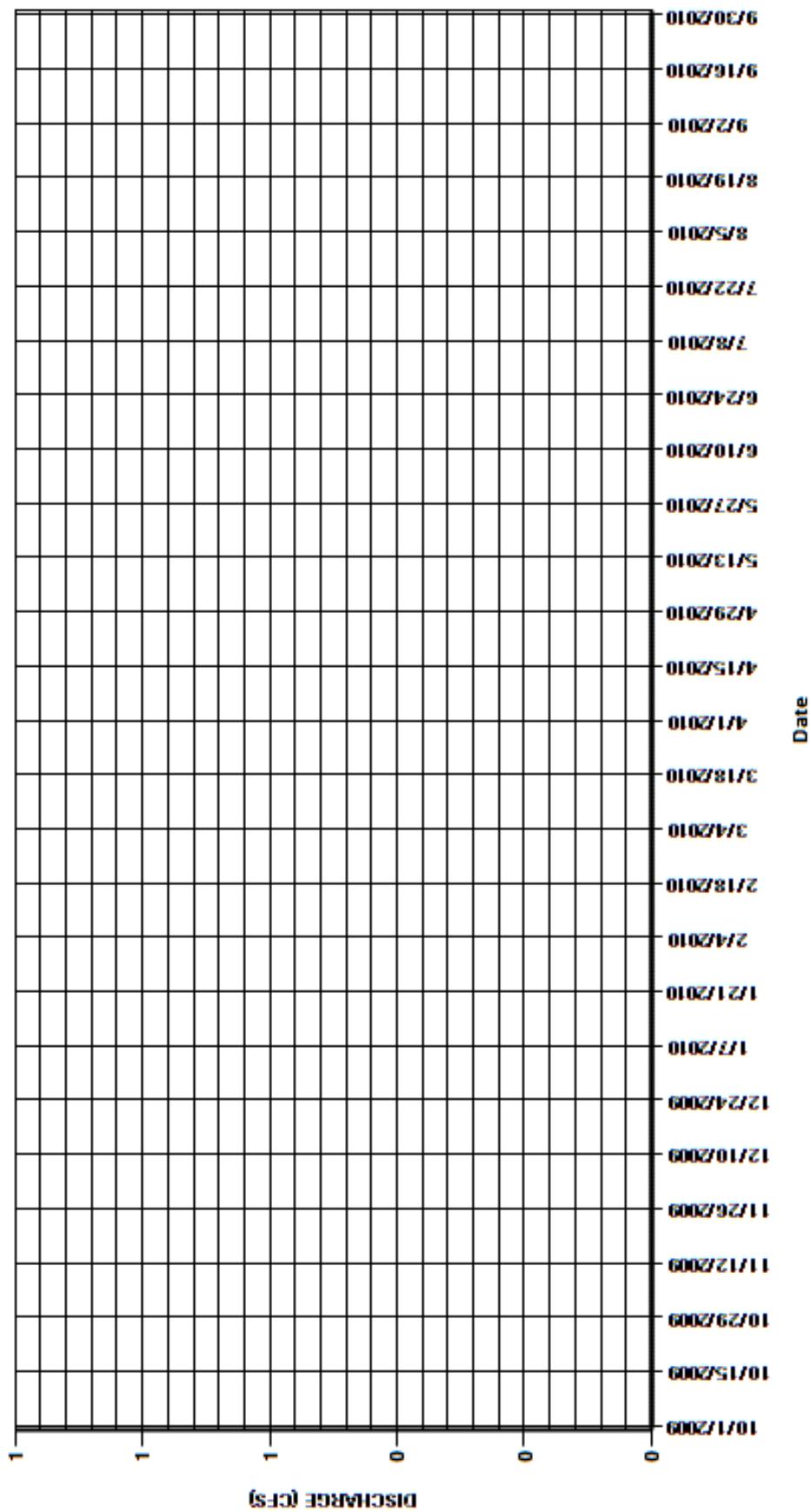
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0
WTR YR	2010	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0

MAX DISCH: (NO WATER RUN THIS WATER YEAR)
MAX GH: FT. (NO WATER RUN THIS WATER YEAR)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746500 SKYLINE DITCH AT CHAMBERS LAKE
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME
Water Year 2010

Location.-- Lat. 40°40'34", Long. 105°50'49"; Laramie-Poudre tunnel diverts water from Laramie River and tributaries to Cache la Poudre River in sec 9, T.8 N., R.75 W.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water stage recorder with Sutron shaft encoder connected to a Satlink 2 satellite monitoring data collection platform (DCP) at a 10 foot Parshall flume. The gage is referenced with a drop tape from a reference point. There is also a supplemental outside staff gage.

Hydrologic Conditions.-- Higher than normal runoff early in the Spring put the Cache La Poudre River on 'free river' status and kept the Laramie Poudre Tunnel diversion off until June 22, 2010. This is a much later start than normal and water was only diverted until September 22, 2010. The tunnel produced 10,740 acre-feet of the 19,875-foot "quota".

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart back up. The record is complete and reliable. The DCP was turned on June 22, 2010 as the tunnel started diverting flow. The DCP ran well all summer with only a few missing hourly values. At the beginning of WY2010 (October 1 – 9, 2009) the transmission antenna was going bad and there were multiple hours of missing DCP transmitted data. Missing data were filled in using hourly chart values with no loss of accuracy.

Datum Corrections.-- Levels were last run on August 20, 2009. The gage was found to be reading correctly with respect to the flume crest.

Rating.-- The rating is a standard 10-ft Parshall Flume rating, STD10FTPEXP. It was used for the entire water year. One measurement (No. 52) was made this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 10 ft Parshall Flume is 6 to 200 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. Given this fact, flows above 200 cfs, which occurred June 25 - 27, 2010 and flows below 6 cfs which occurred June 22 – 23, 2010 are considered poor. The peak flow of 248 cfs occurred at 1815 June 26, 2010 at a gage height of 3.16 ft with a zero shift.

Discharge.-- Measurement 52 showed a shift of +0.05 ft but was discounted +6% to a zero shift. A zero shift has always been used at this gage, and was continued this year. However, the positive trend at this flume continued this year and may need to be considered for a specialized flume rating or using the positive shifts if this trend continues.

Special Computations.-- None.

Remarks.-- Record is good. Record developed by Lee Cunning.

Recommendations.-- The source of the positive shifts should be investigated. If the shifts are confirmed, then measurements should not be adjusted to zero. Some suggestions are as follows: mMultiple measurements with different meters and at different flow rates should be made next year. Spurious GH's during measurement due to hydrographer in flume should be documented in field notes. Aquacalc meter rating files should be kept current so that field discharges are accurate. Levels should be run in Water Year 2011 to determine possible sources of shifts. The flume crest should be established with 1 ft intervals, and shots should be taken on the floor at the inlet, staff and upstream corners. Approach velocities and any other source of positive shifts should be checked out, and documented in future Station Analyses and Descriptions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME

RATING TABLE--

STD10FTPFEKP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	0	0	0	0	0	0	0	0	160	61	18
2	23	0	0	0	0	0	0	0	0	170	64	17
3	21	0	0	0	0	0	0	0	0	165	59	17
4	21	0	0	0	0	0	0	0	0	140	63	16
5	20	0	0	0	0	0	0	0	0	117	57	15
6	18	0	0	0	0	0	0	0	0	105	52	16
7	18	0	0	0	0	0	0	0	0	108	49	15
8	18	0	0	0	0	0	0	0	0	121	48	15
9	7.1	0	0	0	0	0	0	0	0	104	45	15
10	0	0	0	0	0	0	0	0	0	96	41	14
11	0	0	0	0	0	0	0	0	0	91	38	14
12	0	0	0	0	0	0	0	0	0	87	37	13
13	0	0	0	0	0	0	0	0	0	87	35	12
14	0	0	0	0	0	0	0	0	0	90	33	12
15	0	0	0	0	0	0	0	0	0	89	31	11
16	0	0	0	0	0	0	0	0	0	80	35	11
17	0	0	0	0	0	0	0	0	0	72	36	11
18	0	0	0	0	0	0	0	0	0	68	31	10
19	0	0	0	0	0	0	0	0	0	66	33	9.8
20	0	0	0	0	0	0	0	0	0	62	33	9.5
21	0	0	0	0	0	0	0	0	0	61	29	9.5
22	0	0	0	0	0	0	0	0	1.1	63	28	7.3
23	0	0	0	0	0	0	0	0	1.9	58	28	0
24	0	0	0	0	0	0	0	0	38	54	26	0
25	0	0	0	0	0	0	0	0	160	51	24	0
26	0	0	0	0	0	0	0	0	209	49	23	0
27	0	0	0	0	0	0	0	0	197	47	20	0
28	0	0	0	0	0	0	0	0	180	54	20	0
29	0	0	0	0	---	0	0	0	169	63	20	0
30	0	0	0	0	---	0	0	0	163	64	19	0
31	0	---	0	0	---	0	---	0	---	59	19	---
TOTAL	167.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1119.00	2701	1137	288.10
MEAN	5.39	0	0	0	0	0	0	0	37.3	87.1	36.7	9.6
AC-FT	331	0	0	0	0	0	0	0	2220	5360	2260	571
MAX	23	0	0	0	0	0	0	0	209	170	64	18
MIN	0	0	0	0	0	0	0	0	0	47	19	0

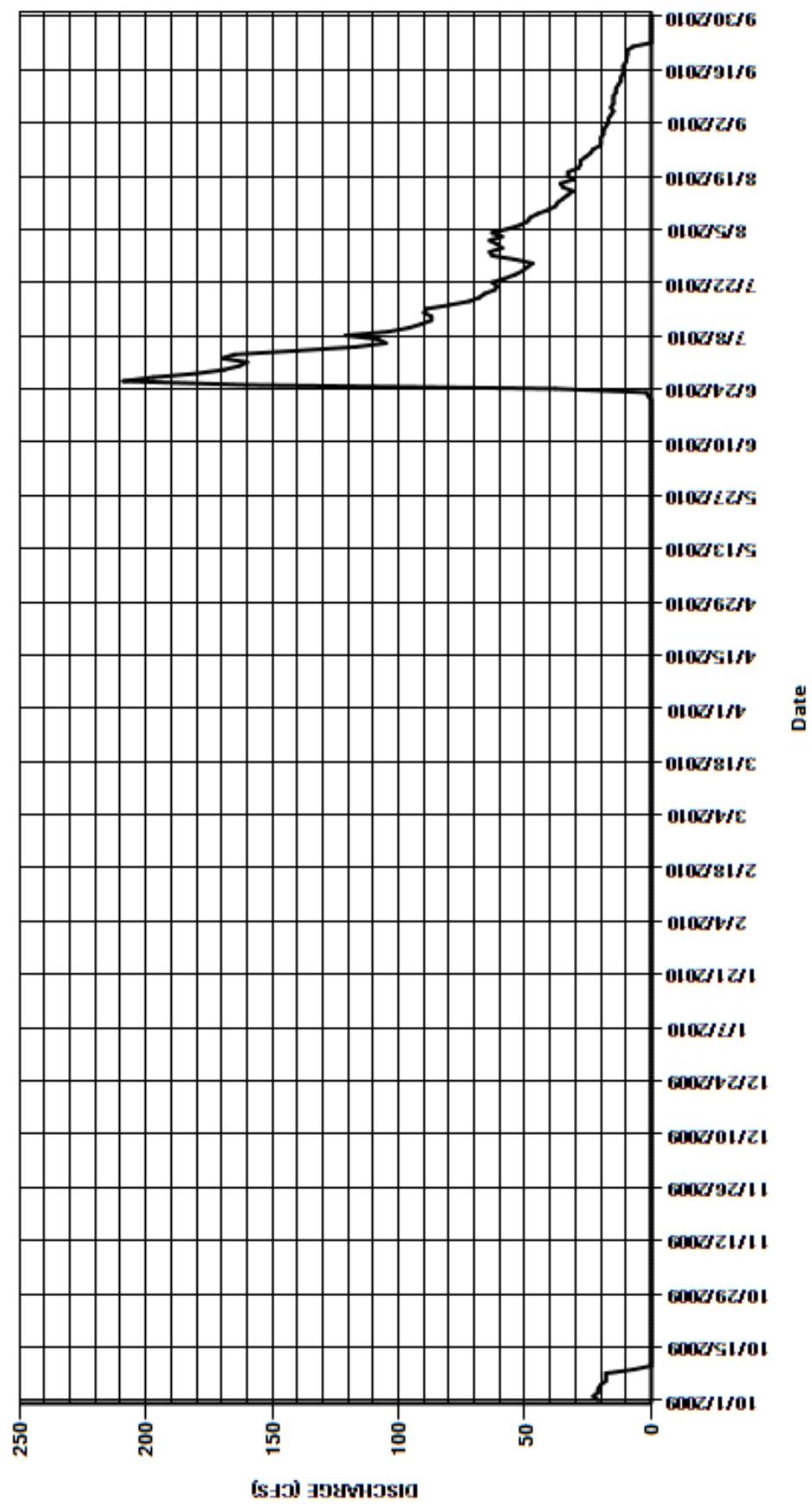
CAL YR	2009	TOTAL	7252.50	MEAN	19.9	MAX	195	MIN	0	AC-FT	14390
WTR YR	2010	TOTAL	5412.20	MEAN	14.8	MAX	209	MIN	0	AC-FT	10740

MAX DISCH: 248 CFS AT 18:15 ON Jun. 26,2010 GH 3.16 FT. SHIFT 0 FT.

MAX GH: 3.16 FT. AT 18:15 ON Jun. 26,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06747000 LARAMIE POUDRE TUNNEL @ 10 FT MARSHALL FLUME
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY
Water Year 2010

Location.-- Lat 40°31'50", long 105°45'40" Sec. 11, T9N, R75W.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water-stage recorder and Sutron Stage Discharge Recorder (SDR) in a metal shelter with stilling well at a 3 -foot Parshall flume owned by the City of Greeley. There is a staff in the flume and a drop tape for the well, with the drop tape being the primary reference.

Hydrologic Conditions.-- The snow pack in this area was slightly above normal this year. Due to cooler temperatures, above average snowpack and copious amounts of rainfall throughout the Spring runoff, the ditch was not turned on this water year. The Poudre River was on 'Free River' status into July.

Gage-Height Record.-- No water was run this Water Year.

Datum Corrections.-- Levels were run on October 7, 2004 tying the average crest height to a reference point on the shelf. A drop tape was made. The staff reads approximately 0.04 ft lower than the drop tape. The crest of the flume is nearly level (only about 0.01 ft change across the crest). There is a slight 'tilt' at the staff to the inlets of about 0.15 feet. The floor of the flume at the staff is about 0.04 feet higher causing the outside staff to read about 0.04 feet less than the drop tape. Levels were ran on June 8, 2009. Flume crest and RP were found to be stable and reading correctly.

Rating.-- Rating No. 1, a standard 3-foot Parshall flume rating table, is used.

Discharge.-- No water was run this Water Year.

Special Computations.-- None.

Remarks.-- Record good. Record developed by Lee Cunning.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY

RATING TABLE--

STD03FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

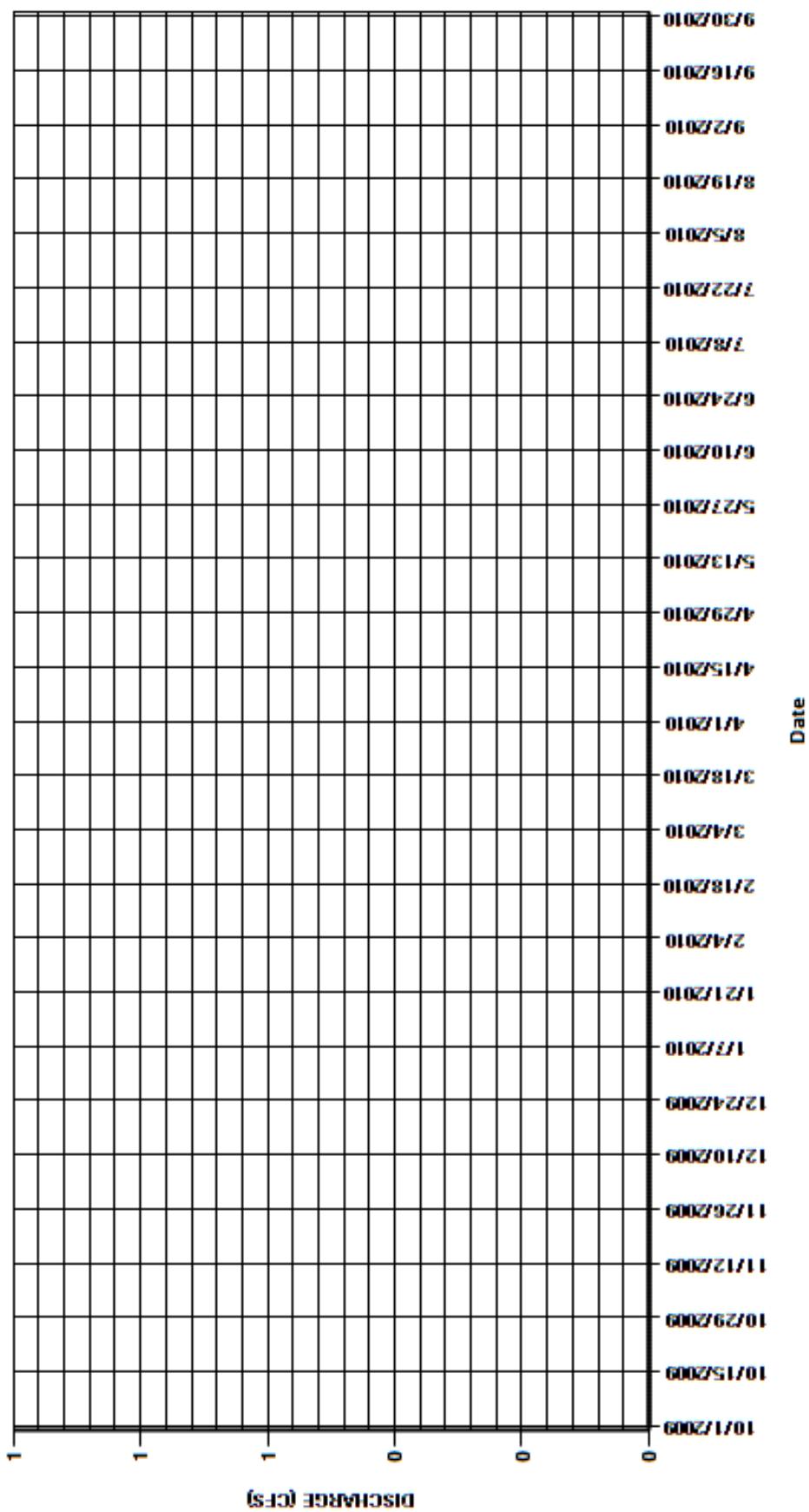
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	150.62	MEAN	0.41	MAX	11	MIN	0	AC-FT	299
WTR YR	2010	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0

MAX DISCH: (NO WATER RUN THIS WATER YEAR)
MAX GH: FT. (NO WATER RUN THIS WATER YEAR)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOBCREEKDITCH NEAR DEADMAN MTN.. NEAR GLENDEVEY
WY2010 HYDROGRAPH



PLATTE RIVER BASIN
DEADMAN DITCH NEAR DEADMAN PARK
Water Year 2010

Location.-- Lat 40°50'04", long 105°48'05", sec. 9, T. 10 N., R. 75 W., Diverts water from Laramie River and tributaries, to Sheep Creek (tributary to Cache La Poudre River) via Sand Creek.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water-stage recorder and Sutron Stage Discharge Recorder (SDR) at a 6 foot Parshall flume. The recorder is in a steel shelter and the gage is referenced with an outside staff gage in the flume.

Hydrologic Conditions.-- Various entities decided to plow the road into this site and scoop the snow out of the ditch.

Gage-Height Record.-- The primary record is hourly averages of 5-minute data taken from the SDR with the chart as backup. The record is complete and reliable.

Datum Corrections.-- Levels were last run across the crest of the flume on August 6, 2009. The gage was reading correctly at that time. A new Reference Mark (RM 2) was established on the right side footer of the downstream (D/S) wing-wall. The elevation established for RM 2 was 0.862 ft.

Rating.-- A standard 6 ft. Parshall rating is used, and is defined for all ranges of flow experienced at the gage this year. No measurements were made this water year. The peak flow of 25.2 cfs occurred at 1815 July 30, 2010 at a gage height of 1.03 ft with a shift of 0.00 ft.

Discharge.-- All past measurements have shown a zero shift or discounted to zero shift. Discharge was computed by direct application of the rating to the period of gage height record.

Special Computations.-- None.

Remarks.-- Record is good. The ditch was started up on June 23, 2010 and was shut off on August 11, 2010. The gage height record was worked by Lee Cunning and checked by the district 3 deputy water commissioner, Mark Simpson.

Recommendations.-- Re-check RM 2 with levels next water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN DITCH NEAR DEADMAN PARK

RATING TABLE--

STD06FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	5.3	2.1	0
2	0	0	0	0	0	0	0	0	0	4.9	2.6	0
3	0	0	0	0	0	0	0	0	0	4.9	1.8	0
4	0	0	0	0	0	0	0	0	0	4.4	1.7	0
5	0	0	0	0	0	0	0	0	0	4	1.7	0
6	0	0	0	0	0	0	0	0	0	3.5	1.5	0
7	0	0	0	0	0	0	0	0	0	4.2	1.3	0
8	0	0	0	0	0	0	0	0	0	5.4	1.4	0
9	0	0	0	0	0	0	0	0	0	3.9	1.3	0
10	0	0	0	0	0	0	0	0	0	3.3	1.4	0
11	0	0	0	0	0	0	0	0	0	3.2	0.53	0
12	0	0	0	0	0	0	0	0	0	2.6	0	0
13	0	0	0	0	0	0	0	0	0	2.2	0	0
14	0	0	0	0	0	0	0	0	0	2	0	0
15	0	0	0	0	0	0	0	0	0	2	0	0
16	0	0	0	0	0	0	0	0	0	1.8	0	0
17	0	0	0	0	0	0	0	0	0	1.7	0	0
18	0	0	0	0	0	0	0	0	0	1.8	0	0
19	0	0	0	0	0	0	0	0	0	1.7	0	0
20	0	0	0	0	0	0	0	0	0	1.6	0	0
21	0	0	0	0	0	0	0	0	0	1.8	0	0
22	0	0	0	0	0	0	0	0	0	1.9	0	0
23	0	0	0	0	0	0	0	0	3.1	1.5	0	0
24	0	0	0	0	0	0	0	0	8.2	1.3	0	0
25	0	0	0	0	0	0	0	0	7.1	1.3	0	0
26	0	0	0	0	0	0	0	0	8.1	1.3	0	0
27	0	0	0	0	0	0	0	0	8	1.2	0	0
28	0	0	0	0	0	0	0	0	6	1.5	0	0
29	0	0	0	0	---	0	0	0	5.6	2.6	0	0
30	0	0	0	0	---	0	0	0	5.8	8.1	0	0
31	0	---	0	0	---	0	---	0	---	4.1	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.90	91.0	17.33	0.00
MEAN	0	0	0	0	0	0	0	0	1.73	2.94	0.56	0
AC-FT	0	0	0	0	0	0	0	0	103	180	34	0
MAX	0	0	0	0	0	0	0	0	8.2	8.1	2.6	0
MIN	0	0	0	0	0	0	0	0	0	1.2	0	0

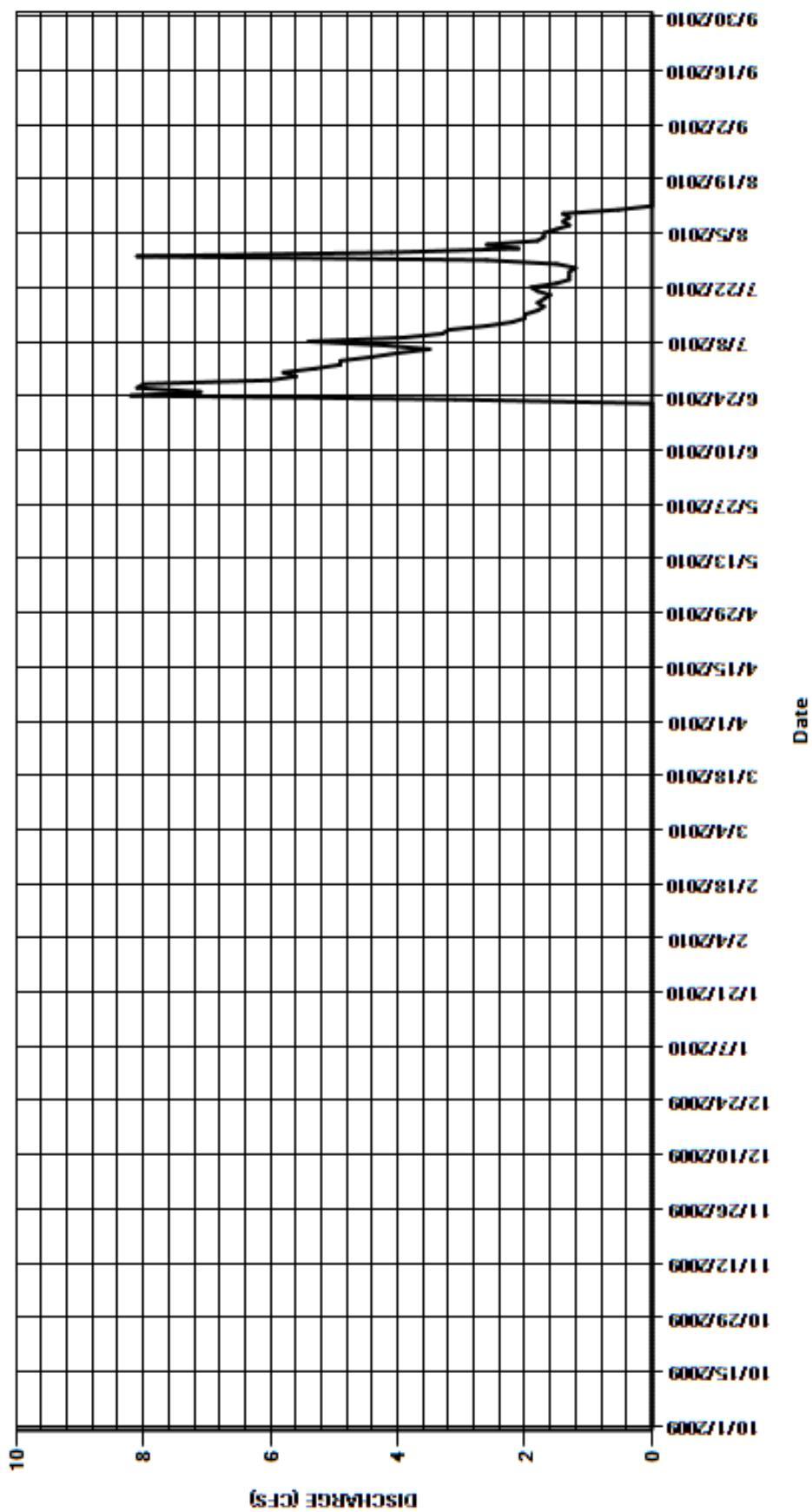
CAL YR	2009	TOTAL	650.70	MEAN	1.78	MAX	24	MIN	0	AC-FT	1290
WTR YR	2010	TOTAL	160.23	MEAN	0.44	MAX	8.2	MIN	0	AC-FT	318

MAX DISCH: 25.2 CFS AT 18:15 ON Jul. 30,2010 GH 1.03 FT. SHIFT 0 FT.

MAX GH: 1.03 FT. AT 18:15 ON Jul. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN DITCH NEAR DEADMAN PARK
WY2010 HYDROGRAPH



PLATTE RIVER BASIN

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

Water Year 2010

Location.-- Lat. 40°54'31", Long. 105°46'43"; Diverts water from Sand Creek and Deadman Creek in Laramie River basin to Sheep Creek (tributary to North Fork Cache la Poudre River) in sec. 23, T.11 N., R.75 W., in the Cache la Poudre River basin.

Drainage and Period of Record.-- N/A.

Equipment.-- Weekly graphic water-stage recorder and shaft encoder connected to a satellite monitoring DCP at a 10 foot Parshall flume. Primary reference gage is a drop tape from an RP on the instrument shelf in the shelter. There is a supplemental outside staff gage in the flume.

Hydrologic Conditions.-- This was an average year for snow-pack. The ditch started May 23 and turned off August 12.

Gage-Height Record.-- Primary record is hourly averages of 15-minute data taken from satellite monitoring with the chart as a back up. The record is complete and reliable. Chart was started May 23, 2010 by the Ditch Rider. The satellite equipment was brought online June 7 by Mark Simpson. Reliable hourly chart data were used May 23 – June 7 with no loss of accuracy. The gage was visited twice during the season by a hydrographer and was found to be reading accurately both visits. During May 23-29, the chart was set +0.13 feet high. Actual chart readings were entered into the record spreadsheet and a -0.13 ft gage height correction was applied for the period. During May 29-30, the chart was set -0.06 ft low. Actual chart readings were entered into the record spreadsheet and a +0.06 ft gage height correction was applied. During May 30–June 3, a gradual +0.02 ft pen correction was noted. Actual chart readings were entered into the record spreadsheet and a +0.02 ft correction was then applied by time proration.

Datum Corrections.-- Levels were last run Aug 6, 2009 across the crest of the flume and to the IG. The tape was found to be reading accurately. A new Reference Mark (RM 2) was established on the top of the downstream right wing wall, Elevation = 3.948 ft.

Rating.-- A standard 10 ft Parshall flume rating is used. No measurements were made this Water Year. The peak flow of 54.1 cfs occurred at 1745 May 28, 2010 at a gage height of 1.22 ft (gage height correction of -0.13 ft applied) with a zero shift.

Discharge.-- Shifts have been zero or adjusted to zero in the past. With levels being run and no conditions documented which would adversely affect the flume operation, this practice was continued.

Special Computations.-- None.

Remarks.-- Water was run from May 23rd until August 12th when the ditch was shut off. Record developed by Lee Cunning.

Recommendations.-- Measurements are needed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPFEKP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

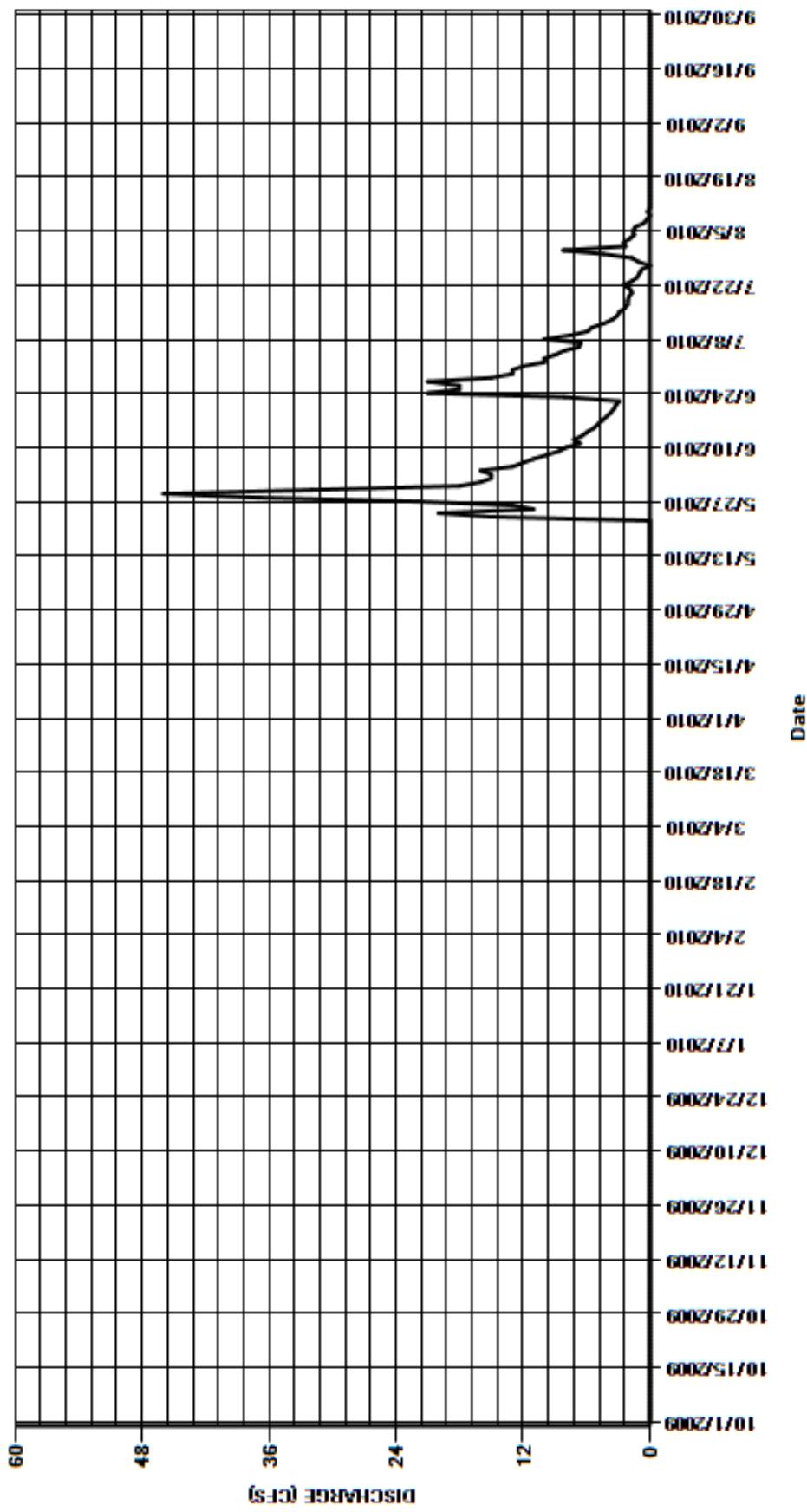
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	16	12	2.3	0
2	0	0	0	0	0	0	0	0	15	10	2.5	0
3	0	0	0	0	0	0	0	0	15	10	1.9	0
4	0	0	0	0	0	0	0	0	16	8.9	1.5	0
5	0	0	0	0	0	0	0	0	13	8.1	1.6	0
6	0	0	0	0	0	0	0	0	12	6.7	1.4	0
7	0	0	0	0	0	0	0	0	11	6.5	0.59	0
8	0	0	0	0	0	0	0	0	9.8	10	0.28	0
9	0	0	0	0	0	0	0	0	8.6	7.5	0	0
10	0	0	0	0	0	0	0	0	7.9	5.9	0.22	0
11	0	0	0	0	0	0	0	0	6.6	5.5	0	0
12	0	0	0	0	0	0	0	0	7.2	4.4	0	0
13	0	0	0	0	0	0	0	0	6.4	3.6	0	0
14	0	0	0	0	0	0	0	0	5.9	3.1	0	0
15	0	0	0	0	0	0	0	0	5.3	2.9	0	0
16	0	0	0	0	0	0	0	0	4.9	2.4	0	0
17	0	0	0	0	0	0	0	0	4.5	2.1	0	0
18	0	0	0	0	0	0	0	0	4.1	2.1	0	0
19	0	0	0	0	0	0	0	0	3.7	2	0	0
20	0	0	0	0	0	0	0	0	3.4	1.7	0	0
21	0	0	0	0	0	0	0	0	3.2	1.9	0	0
22	0	0	0	0	0	0	0	0	2.9	2.5	0	0
23	0	0	0	0	0	0	0	15	8.1	1.7	0	0
24	0	0	0	0	0	0	0	20	21	1.2	0	0
25	0	0	0	0	0	0	0	11	18	1	0	0
26	0	0	0	0	0	0	0	13	18	0.78	0	0
27	0	0	0	0	0	0	0	22	21	0	0	0
28	0	0	0	0	0	0	0	37	15	1.1	0	0
29	0	0	0	0	---	0	0	46	13	1.7	0	0
30	0	0	0	0	---	0	0	32	13	4.4	0	0
31	0	---	0	0	---	0	---	18	---	8.2	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	214.00	309.5	139.88	12.29	0.00
MEAN	0	0	0	0	0	0	0	6.9	10.3	4.51	0.4	0
AC-FT	0	0	0	0	0	0	0	424	614	277	24	0
MAX	0	0	0	0	0	0	0	46	21	12	2.5	0
MIN	0	0	0	0	0	0	0	0	2.9	0	0	0

CAL YR	2009	TOTAL	1471.06	MEAN	4.03	MAX	73	MIN	0	AC-FT	2920
WTR YR	2010	TOTAL	675.67	MEAN	1.85	MAX	46	MIN	0	AC-FT	1340

MAX DISCH: 54.1 CFS AT 17:45 ON May. 28,2010 GH 1.22 FT. SHIFT 0 FT. (-0.13 FT GH CORR. APPLIED)
MAX GH: 1.22 FT. AT 17:45 ON May. 28,2010 (-0.13 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT MARSHALL FLUME
WY2010 HYDROGRAPH



REPUBLICAN RIVER BASIN

PIONEER DITCH

Water Year 2010

Location.--	Lat. 40°05'05", Long. 102°08'30", SW¼NE¼ sec. 2, T.1 N., R.43 W., Yuma County, 4 mi east of Wray, Co., 1000 ft south of U.S. Highway 34.
Drainage and Period of Record.--	N/A
Equipment.--	Weekly graphic water stage recorder and Sutron shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in a metal box enclosure and well section at a 5 -foot Parshall flume in a concrete lined canal. The canal is equipped with a timber suspended in the flow upstream of the gage to slow down velocities into the flume. The primary reference gage is an outside staff gage in the flume.
Hydrologic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. Diversion is regulated by obligations to the states of Kansas and Nebraska under the Republican River Compact .
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable. The gage is a seasonal gage. The gage was shut off on November 19, 2009 for the winter. On April 20th, 2010 State of Colorado personnel set the chart and turned the satellite telemetry back on. Both chart and shaft encoder were set to 0.00 ft, but this practice was ruled out for future operation. Due to mud in the well, the gage height cannot be set at this gage unless there is water in the flume and inlets are flushed. The record is supported by calibration visits recorded on visit sheets. An encoder correction of +0.07 ft was applied to the record without loss of accuracy when the flow was started in May. Seven other adjustments of - 0.02 to +0.03 ft were applied to the record for short periods. Encoder corrections of +/-0.01 ft were applied this year, but could be ignored if appropriate since the outside staff is read as the primary reference. A residual non-zero gage height is typically seen due mud in the well after the water is turned off. This year gage heights below about 0.16 ft were considered zero flow. The canal was off on the following days: October 15, 2009 to May 4, 2010, May 8-9, 18-23, 29-31, 2010, June 13-14, 2010 .
Datum Corrections.--	Levels were last run to the crest of the flume on August 24, 2006. The crest was found to be an average of 0.027 ft higher than the staff zero point. This would account for about 0.02 ft of the negative shift seen on the flume. No correction was made to the staff.
Rating.--	The concrete canal is trapezoidal and has a concave transition to the flume. (This is opposite the traditional modified Parshall transition.) The canal was originally dirt, and when it was lined the flume approach velocities greatly increased. A timber was suspended in the flow above the flume to dissipate energy. Accumulation of weeds and trash on the timber has caused unpredictable velocity variations across the flume. The canal is straight above and below the flume. Submergence is not a problem. Control is a 5-foot steel Parshall Flume. A standard 5- foot Parshall Flume rating, STD05FTPF, was used again this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 5 ft Parshall Flume is 1.56 to 85.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. In 2010 no days had flows recorded outside the defined range. Colorado Water Resources and Nebraska Natural Resources personnel made fifteen measurements (Nos. 697 – 711) during the 2010 water year. They ranged in discharge from 7.62 to 27.3 cfs. The peak flow of 29.2 cfs occurred at 0700 July 13, 2010 at a gage height of 1.29 ft (gage height correction of +0.02 ft applied) with a shift of -0.02 ft. It exceeded Measurement no. 710, made September 9, 2010 by 0.03 ft in stage.
Discharge.--	Shifting control method was used the entire year. Approach velocities cause shifts. Trash on the timber above the gage visibly affected flow distribution in the flume and could account for some variability in the shifts. Moss and sediment in the canal can also have some slight effects on the flume. Given the variability of approach conditions over time, time shifting is used. Measurements show unadjusted shifts varying between -0.01 and -0.08 feet. Shift adjustments are made to average out shifts, since a particular shift may be transitory. Straight time shifting was used with no consideration to stage, since stage effects would be due to control changes and the control is not changing here—only the approach conditions. One measurement, No 699 made by Nebraska, was not used since the width was inconsistent with the notched-board section established for measurements at this gage. Nine of the remaining fourteen measurements made were adjusted, to even the shifts out to a -0.02 ft shift for most of the year. Three had plus adjustments and six had minus adjustments. All adjustments were 5% or less, except for No. 709 (Nebraska) which was adjusted 7% since it was a fair measurement in terms of maximum discharge per section. In fact, all of the Nebraska measurements used were adjusted to show more water (minus adjustment), since AA meters were used, when the flow depth range would prescribe a pygmy meter be used. In general, Nebraska measurements are reviewed each year for consistency in width, depth and velocities as compared to Colorado measurements. By agreement all measurements are made at an angle iron brace 6.0 ft. in width at the staff cross section. Measured depths are usually quite close to the staff GH, which gives a reasonable check on depths. Velocities are compared with Colorado measurements that are close in time and at similar GH. As mentioned, Nebraska measurement No 699 had some inconsistencies and an outlier shift and was not used.
Special Computations.--	Beginning in May 2010, State of Colorado personnel measured with a custom rated Mag-Head Pygmy meter, taking 21 depths and velocities across the flume at 0.30 ft. intervals. Nebraska Natural Resources personnel used a standard rating AA meter, taking 13 sections at 0.5 ft intervals.
Remarks.--	The record is good. Station maintained and record developed by Devin Ridnour.

Recommendations.--

Levels should be run this coming water year. Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder. Cooperation between the Colorado Hydrographer/Water Commissioner and Nebraska personnel has been helpful in arriving at consistent measurement techniques at this flume. Nebraska's spin times could be documented better. At the start of next season we should again meet with Nebraska and ask them to write on our visit sheets and compare notes on technique. The pygmy meter should always be used at this flume, but if one State uses it and the other does not, then there may be problems with shifts.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH

RATING TABLE--

STD05FTP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

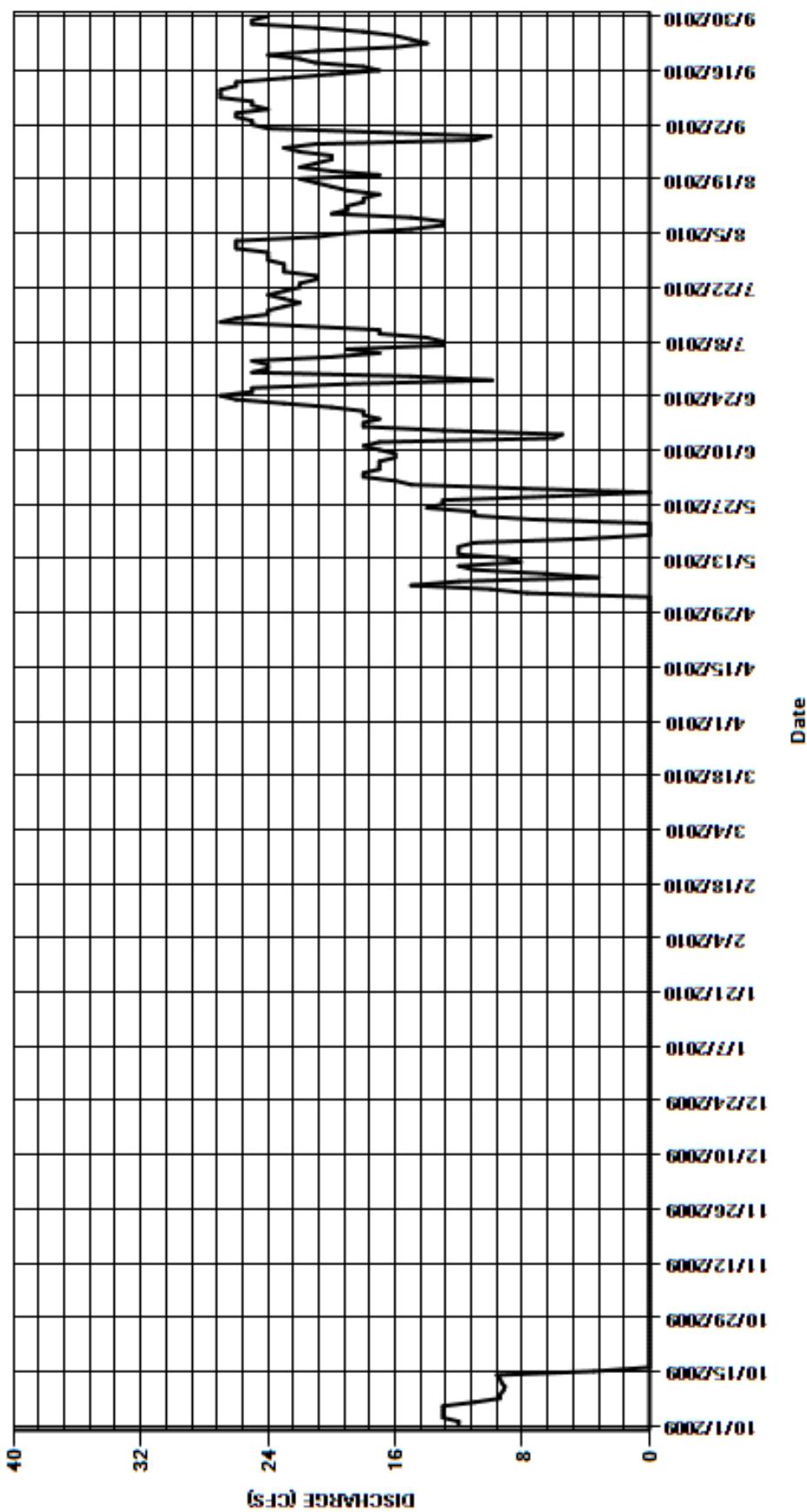
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	0	0	0	0	0	0	0	15	24	26	24
2	12	0	0	0	0	0	0	0	16	24	26	25
3	13	0	0	0	0	0	0	0	18	25	26	25
4	13	0	0	0	0	0	0	7.7	18	20	21	26
5	13	0	0	0	0	0	0	10	17	17	19	26
6	13	0	0	0	0	0	0	15	17	19	15	24
7	11	0	0	0	0	0	0	0	12	17	13	25
8	9.4	0	0	0	0	0	0	3.2	16	13	13	25
9	9.4	0	0	0	0	0	0	6.6	16	14	15	27
10	9.2	0	0	0	0	0	0	11	17	17	20	27
11	9.1	0	0	0	0	0	0	12	18	17	19	27
12	9.3	0	0	0	0	0	0	8.1	17	22	19	26
13	9.4	0	0	0	0	0	0	8.8	6	27	18	26
14	9.6	0	0	0	0	0	0	12	5.5	26	18	23
15	3.5	0	0	0	0	0	0	12	13	24	17	20
16	0	0	0	0	0	0	0	12	18	24	19	17
17	0	0	0	0	0	0	0	11	18	23	20	18
18	0	0	0	0	0	0	0	4.2	17	22	21	21
19	0	0	0	0	0	0	0	0	18	23	22	22
20	0	0	0	0	0	0	0	0	18	24	17	24
21	0	0	0	0	0	0	0	0	20	23	20	21
22	0	0	0	0	0	0	0	0	23	22	22	16
23	0	0	0	0	0	0	0	7.3	26	22	21	14
24	0	0	0	0	0	0	0	11	27	21	20	15
25	0	0	0	0	0	0	0	11	25	21	20	16
26	0	0	0	0	0	0	0	14	25	23	22	18
27	0	0	0	0	0	0	0	13	19	23	23	21
28	0	0	0	0	0	0	0	13	9.9	23	21	25
29	0	0	0	0	---	0	0	6.1	15	24	11	25
30	0	0	0	0	---	0	0	0	25	24	10	24
31	0	---	0	0	---	0	---	7.9	---	24	17	---
TOTAL	155.90	0.00	0.00	0.00	0.00	0.00	0.00	228.90	530.4	668	591	673
MEAN	5.03	0	0	0	0	0	0	7.38	17.7	21.5	19.1	22.4
AC-FT	309	0	0	0	0	0	0	454	1050	1320	1170	1330
MAX	13	0	0	0	0	0	0	15	27	27	26	27
MIN	0	0	0	0	0	0	0	0	5.5	13	10	14

CAL YR	2009	TOTAL	2375.73	MEAN	6.51	MAX	28	MIN	0	AC-FT	4710
WTR YR	2010	TOTAL	2847.20	MEAN	7.8	MAX	27	MIN	0	AC-FT	5650

MAX DISCH: 29.2 CFS AT 07:30 ON Jul. 13,2010 GH 1.29 FT. SHIFT -0.02 FT. (+0.02 FT GH CORR. APPLIED)
MAX GH: 1.29 FT. AT 19:00 ON Jun. 23,2010 (+0.02 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH
WY2010 HYDROGRAPH



REPUBLICAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
Water Year 2010

Location.--	Lat. 40°03'25", Long. 102°03'10", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, T.1 N., R.42 W., Yuma County; 1200 ft south of U.S. Highway 34 at Colorado/Nebraska State line.
Drainage and Period of Record.--	N/A.
Equipment.--	Weekly graphic water stage recorder and Sutron shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in a metal box enclosure and well section at a 4-foot Parshall flume. The site has two outside vertical enameled steel staffs (Ha-Hb, with the Hb staff set with 4.0 ft = 0.0). The Ha staff is the primary reference gage.
Hydrologic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. This gage measures water delivered to Nebraska under the Republican River Compact. Heavy rains and some natural springs will cause flows to show up at the flume when the headgate is off. During the winter months an earth dam is in place to let the natural springs flow to the North Fork Republican River.
Gage-Height Record.--	The primary record is hourly averages of telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable. Recorded gage heights less than 0.05 feet were considered zero feet due to the float being beached on the mud in the stilling well. If it is noted the ditch was off on visit logs and some residual GH's were between 0.00 and 0.05, then flow was considered zero. Ditch was off for the following periods of time: October 16, 2009 through May 4, 2010 (off for winter); May 9, 18-23, 29-31, 2010; June 14, 2010. Flow occurred on the following days: April 22-23, 2010 (ditch was off but rain water came in below headgate). Fourteen encoder adjustments were applied (12 of +/- 0.01 ft, 1 of -0.02 ft, 1 of -0.03 ft) using water commissioner visits to support the proration. Two large corrections (-0.21 ft, -0.07 ft) were required for the April 22-23 rainwater-in-the-ditch event, because recorder zero had not been established.
Datum Corrections.--	Levels were last run to the crest of the flume on August 24, 2006. The flume was found to be out of level laterally, with the right side (stilling well intake side) found to be about 0.08 ft lower than the left (staff gage side). This accounts for a part of the positive shifts being measured. No correction was made to the staff.
Rating.--	The control is a 4-foot steel Parshall Flume with concrete sidewalls in a dirt canal. A standard 4-foot Parshall Flume rating table, STD04FTPF, was used this water year. Heavy vegetation builds up on the sides and bottom of the ditch and projects into the flume and narrows the approach. Vegetative growth downstream can also cause submergence. A positive shift can arise from the tilt and the slightly warped geometry of the flume. Encroachment of the flume wing walls into the flume entrance section and the resulting turbulence wake also is contributing to the positive shift and may also cause variability in staff gage readings and/or the need for gage height corrections to the shaft encoder. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. No flows occurred outside this range in WY 2010. Colorado/Nebraska Water Resources personnel made fifteen measurements (Nos. 696-710) during the 2010 water year. They ranged in discharge from 7.12 to 21.2 cfs. The peak flow of 27.5 cfs occurred at 2200 April 22, 2010 at a gage height of 1.32 ft (gage height correction of -0.28 ft applied) with a shift of +0.09 ft. This was caused by a rain event and the ditch was not running. The peak exceeded Measurement No. 706 made July 30, 2010 by 0.22 ft in stage.
Discharge.--	Shifting section control method was used for the year. Measurements for good record show unadjusted shifts varying between +0.06 and + 0.11 feet. Shifts were distributed by time proration. Most shifts were adjusted to smooth distribution. Of the 15 measurements, 10 were discounted up to +/- 5%. Pond weed treatment caused for more positive shifting starting in late July.
Special Computations.--	The record is compared with Pioneer Ditch at the Headgate figures to make sure no Stateline flows are inconsistent with the amounts diverted above. Daily flows greater at Stateline only occurred as a result of time delays when flow was dropping at the headgate, or due to rain events causing runoff into the ditch between the two gages.
Remarks.--	The record is good, except for the following: April 22-23 is fair due to a large encoder corrections. This period includes the peak for the year, which is also rated fair. This is a seasonal gage used for the Republican River Compact. Station maintained and record developed by Devin Ridnour.
Recommendations.--	Levels should be run this coming water year. Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE

RATING TABLE--

STD04FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

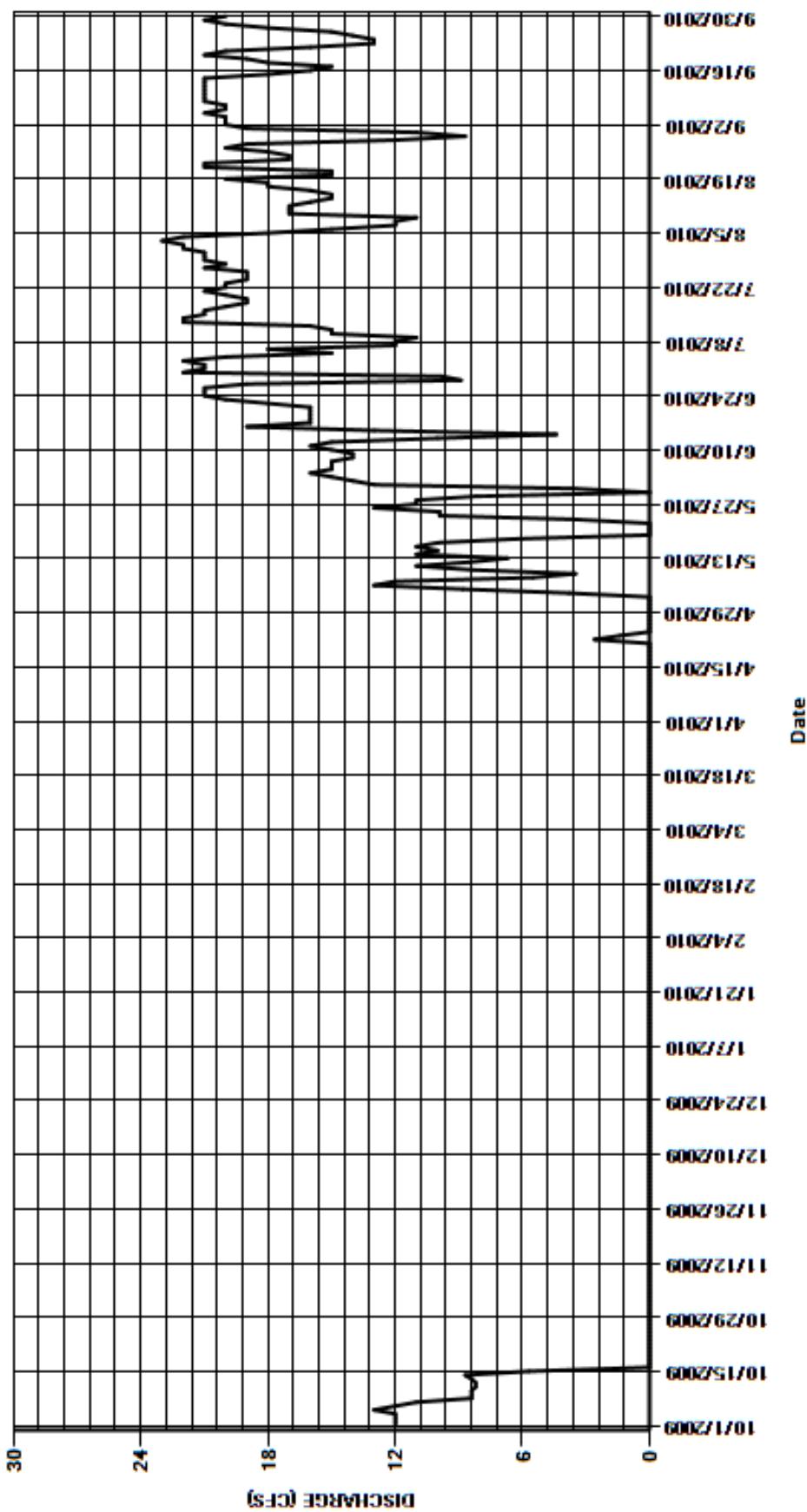
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	0	0	0	0	0	0	0	13	21	22	19
2	12	0	0	0	0	0	0	0	14	21	22	20
3	12	0	0	0	0	0	0	0	15	22	23	20
4	12	0	0	0	0	0	0	3.8	16	20	22	20
5	13	0	0	0	0	0	0	8.8	15	15	18	21
6	12	0	0	0	0	0	0	13	15	18	15	20
7	11	0	0	0	0	0	0	0	12	15	12	20
8	8.4	0	0	0	0	0	0	5.5	14	12	12	21
9	8.4	0	0	0	0	0	0	3.5	14	11	11	21
10	8.4	0	0	0	0	0	0	8.4	15	15	17	21
11	8.2	0	0	0	0	0	0	11	16	15	17	21
12	8.2	0	0	0	0	0	0	8.5	15	16	17	21
13	8.4	0	0	0	0	0	0	6.7	10	22	16	21
14	8.7	0	0	0	0	0	0	11	4.4	22	15	21
15	5.7	0	0	0	0	0	0	10	13	21	15	18
16	0	0	0	0	0	0	0	11	19	21	16	16
17	0	0	0	0	0	0	0	10	16	20	18	15
18	0	0	0	0	0	0	0	6.3	16	19	18	18
19	0	0	0	0	0	0	0	0	16	19	20	19
20	0	0	0	0	0	0	0	0	16	20	15	21
21	0	0	0	0	0	0	0	0	16	21	15	20
22	0	0	0	0	0	0	2.6	0	18	20	21	16
23	0	0	0	0	0	0	1.4	3.4	20	20	21	13
24	0	0	0	0	0	0	0	9.9	21	19	17	13
25	0	0	0	0	0	0	0	9.9	21	19	17	14
26	0	0	0	0	0	0	0	13	21	19	18	15
27	0	0	0	0	0	0	0	11	19	21	20	18
28	0	0	0	0	0	0	0	11	8.9	20	19	20
29	0	0	0	0	---	0	0	8.2	9.8	21	12	21
30	0	0	0	0	---	0	0	0	22	21	8.7	20
31	0	---	0	0	---	0	---	3.6	---	21	11	---
TOTAL	148.40	0.00	0.00	0.00	0.00	0.00	4.00	199.50	464.1	584	520.7	564
MEAN	4.79	0	0	0	0	0	0.13	6.44	15.5	18.8	16.8	18.8
AC-FT	294	0	0	0	0	0	7.9	396	921	1160	1030	1120
MAX	13	0	0	0	0	0	2.6	13	22	22	23	21
MIN	0	0	0	0	0	0	0	0	4.4	11	8.7	13

CAL YR	2009	TOTAL	2113.54	MEAN	5.79	MAX	25	MIN	0	AC-FT	4190
WTR YR	2010	TOTAL	2484.70	MEAN	6.81	MAX	23	MIN	0	AC-FT	4930

MAX DISCH: 27.5 CFS AT 22:00 ON Apr. 22,2010 GH 1.32 FT. SHIFT 0.09 FT. (-0.28 FT GH CORR. APPLIED)
 MAX GH: 1.32 FT. AT 22:00 ON Apr. 22,2010 (-0.28 FT GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
Water Year 2010

Location.-- Lat. 39°15'05", Long. 106°22'28", Lake County, SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T.9 S., R.80 W., on right bank 4.2 miles upstream from junction of Lake Fork Creek and Arkansas River.

Drainage and Period of Record.-- 27.55 sq. mi.

Equipment.-- Satellite-monitored data collection platform (Sutron high data rate SatLink Logger) including a shaft encoder and a Sutron Stage Discharge recorder for backup purposes. The gage is constructed from a 42-inch diameter corrugated metal pipe CMP and concrete well. Shaft encoder and SDR are set to inside electric tape gage mounted on instrument shelf. An outside staff gage is also used for reference purposes. Shelter is equipped with AC power for the well heater. Control is a concrete weir/apron tapered lower from left to right bank, located at gage.

Hydrologic Conditions.-- This gage is located approximately 500 ft from the discharge gates of Sugar Loaf Dam on Turquoise Reservoir. During winter months the flow comes from the gates of the dam and runs through and below the very large boulders in the stream bed and surfaces just before the gage. The water released is warm enough the control does not experience ice affected days. The well is also kept thawed with small tank heater during the winter months.

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite data. SDR record is used for back-up purposes. Record is complete and reliable.

Datum Corrections.-- Levels were last run on May 31, 2007, from BM#3 to the RP. No corrections were needed.

Rating.-- The control is a 38-ft. wide, concrete weir/apron with ogee lip. Rating No. 4A, dated Oct. 1, 1975, was used all water year. It is well defined to about 350 cfs. Three discharge measurements (Nos. 567-569) ranging from 4.69 cfs to 16.4 cfs were made this water year. They cover the range in stage experienced, except for the higher daily flows Apr 30-May 5, June 6-19, 2010; and the lower daily flows of Oct 1-April 27, Aug 24-Sept 30, 2010. The peak flow of 265 cfs occurred at 1730 on June 7, 2010 at a gage height of 1.59 ft with a shift of 0.11 ft. It exceeded the stage of maximum discharge measurement No.567 by 1.07 ft.

Discharge.-- Shifting control method was used for the entire water year. Shifts appear to be affected by control conditions, mainly moss growth and gravel build up above the control. There is also a trend seen in higher historical discharge measurements for larger positive shifts at higher gage heights. Shifts were applied as defined by measurements and distributed by stage and time. Variable stage-shift relationship LFCBSLCOVS10 was used to distribute shifts by stage for the period 0000 10/1/2009 to 1450 8/19/2010. This shift curve is based on historical measurements and current water year measurements. Measurement 567 was discounted 5% to fit the variable stage shift relationship. Moss was cleaned from the control at 1500 8/19/2010 resulting in -0.01 gage height change. This was applied as a shift correction using the results of Measurement 569 made immediately after the control cleaning. Shifts were prorated by time using measured shift of 0.02 ft found with Msmt 569, from 1600 8/19/2010 to the end of the water year.

Special Computations.--

Remarks.-- Record is complete and is considered good. There was a very short duration run of higher flows that made it difficult to try to complete a measurement near the peak. Station maintained and record developed by Cheston Hart.

Recommendations.-- Levels need to be run in WY2011 to verify the PZF and previous levels, as level history indicates a correction to the ET index elevation may be warranted. Once this has been accomplished, the rating should be evaluated for possible revision. High water measurements cannot be made at this gage at this time. A bank operated cable way installation should be further investigated.

STATE OF COLORADO
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07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE

RATING TABLE--

LFCBSLCO04A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	20	17	17	17	3.4
2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	20	17	17	17	3.6
3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	19	16	17	17	3.7
4	3.1	3	3.1	3.1	3.1	3.1	3.1	18	16	17	17	3.9
5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	18	16	17	17	4.2
6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	17	39	17	17	4.5
7	3.1	3.1	3.1	3.1	3.1	3.1	3.1	17	168	17	17	4.6
8	3.1	3.1	3.1	3.1	3.1	3.1	3.1	17	240	17	17	3.9
9	3.1	3.1	3.1	3.1	3.1	3.1	3.1	17	198	17	17	3.1
10	3.1	3.1	3.1	3.1	3.1	3.1	3.1	17	148	17	15	3
11	3.1	3.1	3.1	3.1	3.1	3.1	3.2	17	91	17	12	2.7
12	3.1	3.1	3.1	3.1	3	3.1	3.2	17	45	17	7.9	2.6
13	3.1	3.1	3.1	3.1	2.9	3.1	3.1	17	23	17	5.3	3
14	3.1	3.1	3.1	3.1	2.9	3.1	3.2	17	14	17	5.3	3.4
15	3.1	3.1	3.1	3	3	3.1	3.2	17	19	17	5.2	3.4
16	3.1	3.1	3.1	2.9	2.9	3.1	3.2	17	58	17	4.9	3.3
17	3.1	3.1	3.1	2.9	3	3.1	3.1	17	79	17	4.9	3.4
18	3.1	3.1	3.1	2.9	3.1	3.1	3.1	17	47	17	4.9	3.4
19	3.1	3.1	3.1	2.9	3.1	3.1	3.1	17	23	17	4.8	3.4
20	3.1	3.1	3.1	3.1	3.1	3.1	3.2	17	17	17	5	3.4
21	3.1	3.1	3	3.1	3.1	3.1	3.2	17	17	17	5.3	3.2
22	3.1	3.1	3	3.1	3.1	3.1	3.1	17	17	17	5.1	3.3
23	3.1	3.1	3.1	3.1	3.1	3.1	3	17	17	17	4.9	3.4
24	3.1	3.1	3.4	3.1	3.1	3.1	2.9	17	17	17	3.9	3.4
25	2.9	3.1	3.4	3.1	3.1	3.1	2.9	17	17	17	3.1	3.4
26	3	3	3.4	3.1	3.1	3.1	3	17	17	17	3.1	3.4
27	3.1	3	3.4	3.1	3.1	3.1	3.1	17	17	17	3.1	3.3
28	3.1	3.1	3.4	3.1	3.1	3.1	6	17	17	17	3.1	3.1
29	3.1	3.1	3.4	3.1	---	3.1	16	17	17	17	3.1	3.1
30	3.1	3.1	3.4	3.1	---	3.1	20	17	17	17	3.4	3.3
31	3.1	---	3.4	3.1	---	3.1	---	17	---	17	3.4	---
TOTAL	95.8	92.7	98.3	95.4	85.9	96.1	125.8	537	1461	527	269.7	102.8
MEAN	3.09	3.09	3.17	3.08	3.07	3.1	4.19	17.3	48.7	17	8.7	3.43
AC-FT	190	184	195	189	170	191	250	1070	2900	1050	535	204
MAX	3.1	3.1	3.4	3.3	3.1	3.1	20	20	240	17	17	4.6
MIN	2.9	3	3	2.9	2.9	3.1	2.9	17	14	17	3.1	2.6

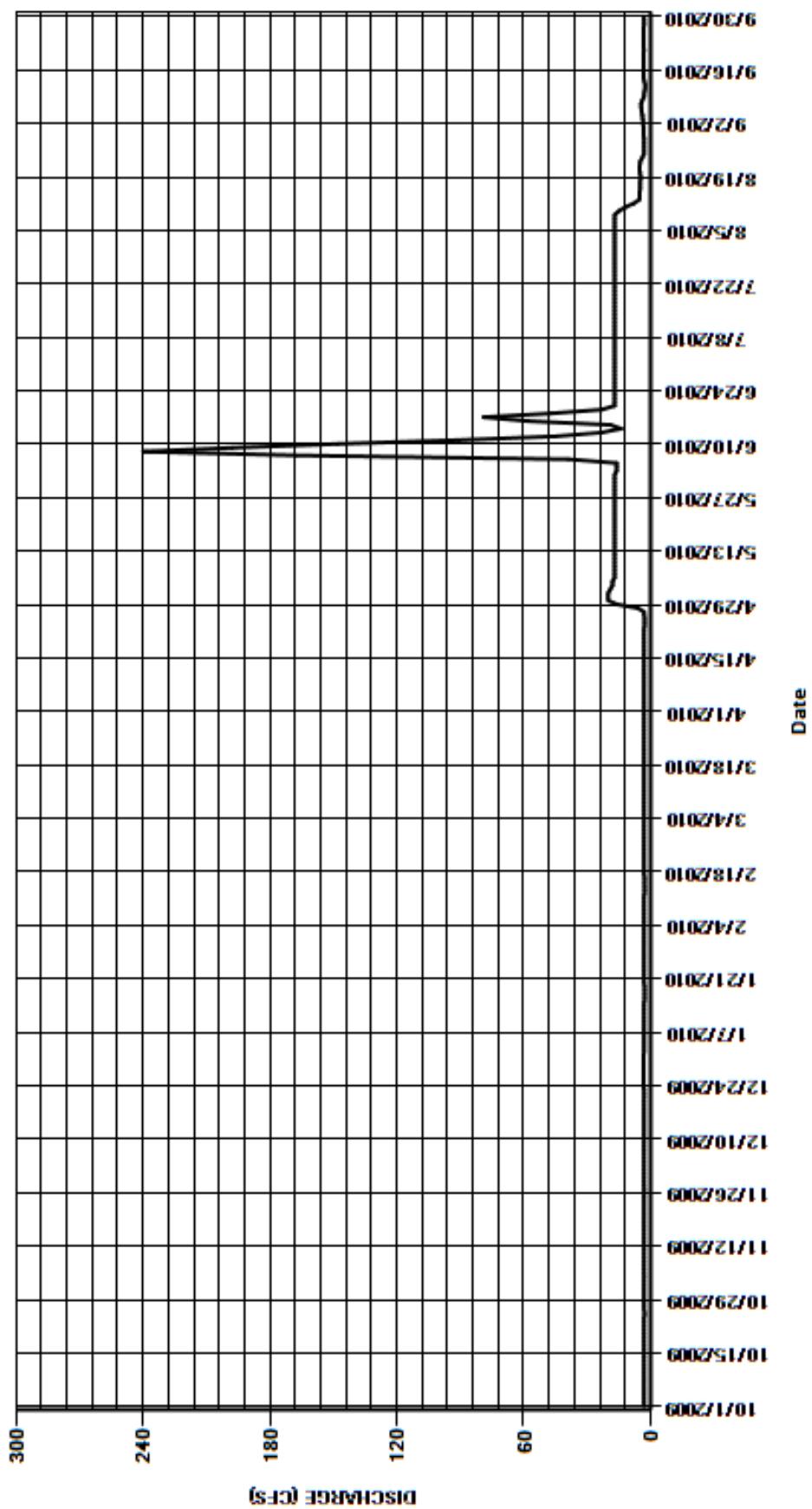
CAL YR	2009	TOTAL	11613.4	MEAN	31.8	MAX	431	MIN	2.9	AC-FT	23040
WTR YR	2010	TOTAL	3587.5	MEAN	9.83	MAX	240	MIN	2.6	AC-FT	7120

MAX DISCH: 265 CFS AT 17:30 ON Jun. 07,2010 GH 1.59 FT. SHIFT 0.11 FT.

MAX GH: 1.59 FT. AT 17:30 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR

Water Year 2010

Location.--	Lat 39°03'47", Long 106°24'28" (Mt. Elbert, Colorado quadrangle, 1:24000 scale), in NE1/4 SE1/4 Sec. 26, T11S, R81W, Lake County, Hydrologic Unit 11020001, on left bank at refurbished concrete section and bridge over Lake Creek originally established by US Forest Service, 1.35 mile upstream from high water line of Twin Lakes Reservoir, 0.65 miles upstream from Willis Creek tributary, and 2.1 miles southwest of village of Twin Lakes CO.
Drainage and Period of Record.--	75 mi ² . April 1946 to Sept. 1962, Oct. 1963 to current year. Monthly data only for some periods.
Equipment.--	Sutron constant flow bubbler sensor and satellite-monitored data collection platform (Sat-Link 2 DCP) in a 4 ft x 4 ft metal shelter. Primary reference gage is a drop wire weight mounted on the pedestrian bridge over the control. A temperature sensor is operated at the site. No changes.
Hydrologic Conditions.--	Lake Creek fills Twin Lakes Reservoir and is tributary to the main stem of the Arkansas River. Flows at the gage are heavily affected by transmountain diversions from the Roaring Fork Basin in Division 5 through Twin Lakes Tunnel and into Lake Creek several miles above the gage. Diversions occur year round. Lake Creek Basin is approximately 73.1 sq miles with a mean elevation of 11,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads and Highway 82 that travels over Independence Pass. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of the fifteen minute DCP log data with satellite data and CFB log used as backup. Record is complete and reliable, except for the following periods: Nov 9, 2009, when ice affected the stage discharge relationship; and, Nov 10, 2009 – April 15, 2010 when the station was closed for the winter. Due to the turbulence at the gage caused by the high flow velocities and large boulders, reading the wire weight gage for the site is very difficult and nearly impossible with accuracy of only +/- 0.10 ft during high water. This water year the wire weight gage was read to note large discrepancies in gage height but corrections were not applied during times of high water. The CFB is set before high water commences. A gage height correction of +0.13 ft was found under lower flow conditions on Aug 2 2010 and applied by time proration back to the last site visit with a good wire weight gage reading prior to runoff, which was on May 20, 2010.
Datum Corrections.--	Levels were last run May 9, 2006.
Rating.--	The control is a 25-ft. long by 41.8 ft. wide concrete apron edged with angle iron on the upstream and downstream sides at lower flows (< about 50 cfs). At higher flows the channel immediately above the concrete section is the control along with the vertical walls of the concrete section. The concrete section also serves as a measuring base for high flow measurements made from a bridge directly over the concrete section. Wading measurements are made on the same concrete apron during winter as this section stays more open than surrounding sections, although considerable ice breaking is required. Outside of winter, wading measurements are made downstream at the old gage location as flow is more laminar and steady there. Whether wading or cabling, velocities are in the extreme range and this station is difficult to measure. This is especially true for cable measurements. For any flows above 500 cfs a 100 lb. weight is required, and the depths are so shallow that placing the meter in the correct velocity profile is problematic. Notwithstanding, a number of the measurements, when plotted on a rating curve, point to the accuracy of rating no. 23 with random errors distributed about it. Rating No. 23, dated Nov 20, 2007, was used this year. Fourteen discharge measurements (Nos. 997-1010) were made during the water year, ranging in discharge from 11.7 to 1280 cfs. Eight of these measurements were during the winter period and have no gage height or shift but are used for winter estimation. Measurements covered the range in stage experienced, except higher daily flows of May 29-June 13, 2010. The peak discharge of 3430 cfs occurred at 2145 June 7, 2010 at a gage height of 7.31 ft. (with a gage height correction of +0.03 ft applied) with a shift of 0.06 ft. It exceeded maximum flow measurement No. 1007, made June 2, 2010, by 2.12 ft. in stage.
Discharge.--	Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time for the periods: 0000 Oct 1 2009 to 1530 May 6, 2010, and from 1000 Aug 13 2010 to the end of the water year. Shifts were distributed by stage during runoff using two variable stage-shift relationships: LAKATLCOVS10A, based on Msmts 1006-1007, applied from 1600 May 6 to 2145 June 7, and LAKATLCOVS10B, based on Msmts 1007-1009, applied from 2200 June 7 to 0910 Aug 13, 2010. Open water measurements for this water year indicated shifts varying from -0.43 to 0.09 ft. Shifts became more negative after the peak and this is attributed to filling in of the approach channel section above the concrete section by cobble and large boulders. The concrete section is essentially no longer the control, and channel control at the section and above controls flows. A shift curve after the peak is used to describe this control change.
Special Computations.--	Discharge for periods of no gage-height or ice affected record were estimated based on record from the upstream station of Twin Lakes Tunnel added to an estimated base flow and adjusted daily from weather records. Estimated base flow is derived from eight measurements (Nos. 998-1005). A hydrograph was used comparing estimated and computed flows with the upstream gage Twin Lakes Tunnel.
Remarks.--	Record is good, except during periods of ice affect and no record, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.--

The approach to the concrete section should be allowed to continue to fill with cobble and boulders. Some of these may need to be re-arranged to help smooth and straighten approach flow velocities and angles and facilitate wire weight gage readings. Additional measurements during peak run off need to be made to help define shifts across the runoff period. Levels need to be run in WY11.

STATE OF COLORADO
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07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR

RATING TABLE-- LAKATLCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

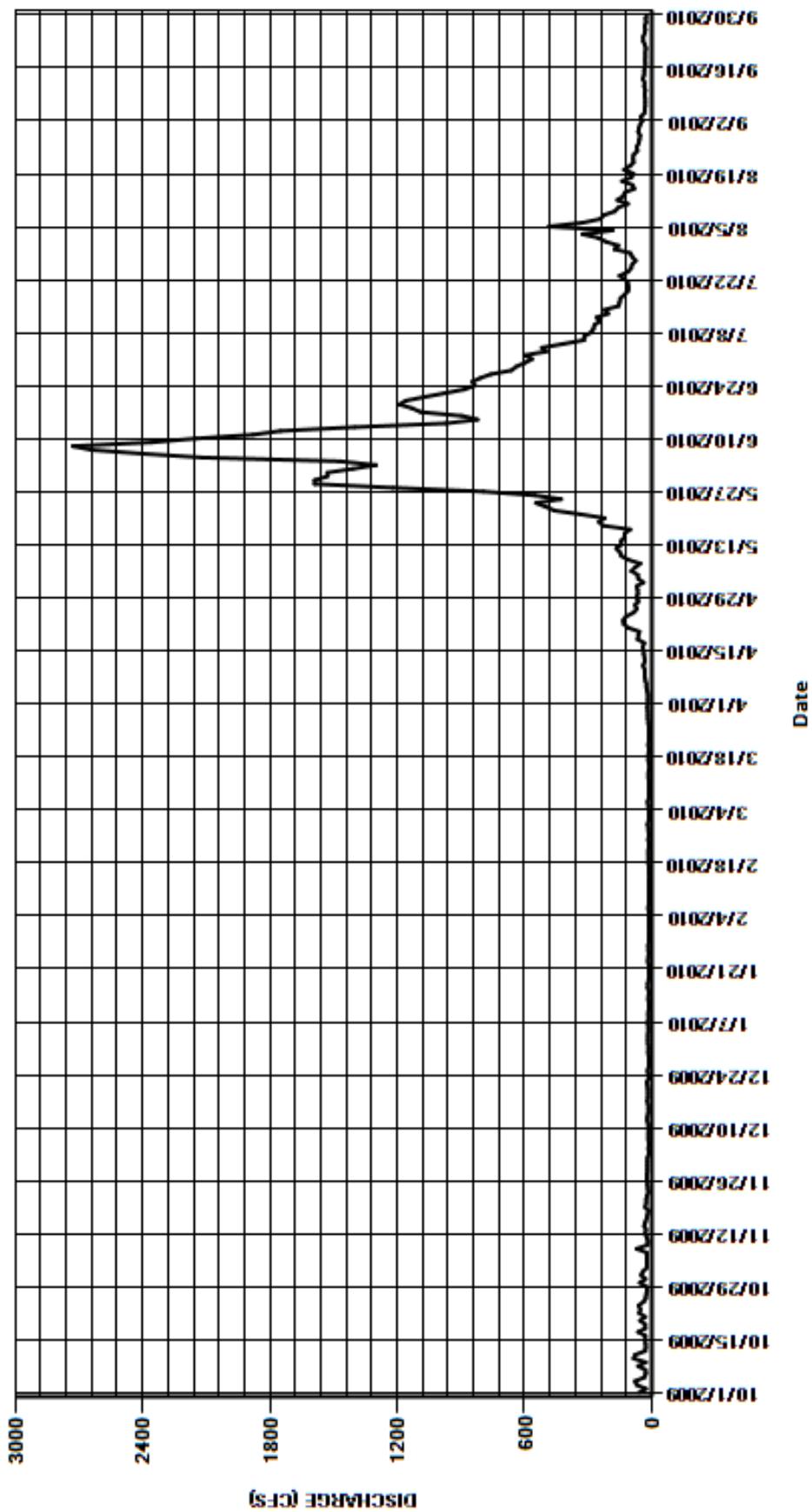
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	51	21	18	15	16	20	67	1530	565	217	55
2	28	42	21	19	15	14	19	72	1410	600	253	45
3	71	24	15	18	14	15	18	40	1300	498	328	52
4	80	24	16	18	16	16	21	65	1470	519	185	35
5	36	24	16	17	15	17	25	66	2120	418	485	33
6	29	24	15	18	17	20	25	97	2400	320	328	32
7	30	25	17	19	15	15	30	78	2640	319	243	31
8	65	72	17	16	14	14	33	54	2730	287	227	32
9	29	20	16	18	14	15	34	112	2360	275	175	34
10	86	19	17	16	14	16	34	144	2150	271	159	31
11	78	25	18	14	14	15	41	151	1880	244	113	36
12	31	32	23	15	16	16	34	168	1750	261	163	34
13	29	27	21	17	15	16	35	144	1400	206	135	43
14	30	36	17	16	13	16	38	145	971	223	127	37
15	31	31	17	15	14	12	40	127	822	157	83	36
16	31	25	18	20	15	14	43	127	895	152	92	34
17	64	21	22	19	15	17	36	102	1090	149	141	30
18	30	16	19	16	17	17	67	231	1130	129	96	32
19	31	32	18	13	16	16	64	249	1190	112	88	30
20	56	27	19	15	17	14	59	223	1160	110	132	31
21	31	27	21	15	17	17	111	336	1070	113	104	28
22	60	23	24	16	15	15	133	461	975	126	86	33
23	54	17	15	19	14	16	135	501	883	153	89	41
24	63	20	17	17	17	15	122	546	834	114	86	42
25	38	21	20	15	15	16	87	428	847	98	68	34
26	28	23	16	17	16	15	71	552	808	93	72	31
27	27	23	14	18	16	17	80	794	758	76	62	34
28	22	23	15	15	20	19	63	1220	662	93	59	27
29	26	22	16	15	---	19	73	1590	640	102	55	29
30	57	22	18	15	---	20	66	1590	599	177	64	25
31	30	---	16	13	---	21	---	1530	---	158	61	---
TOTAL	1362	818	555	512	431	501	1657	12010	40474	7118	4576	1047
MEAN	43.9	27.3	17.9	16.5	15.4	16.2	55.2	387	1349	230	148	34.9
AC-FT	2700	1620	1100	1020	855	994	3290	23820	80280	14120	9080	2080
MAX	86	72	24	20	20	21	135	1590	2730	600	485	55
MIN	22	16	14	13	13	12	18	40	599	76	55	25
CAL YR	2009	TOTAL	74713	MEAN	205	MAX	1680	MIN	11	AC-FT	148200	
WTR YR	2010	TOTAL	71061	MEAN	195	MAX	2730	MIN	12	AC-FT	140900	

MAX DISCH: 3430 CFS AT 21:45 ON Jun. 07,2010 GH 7.31 FT. SHIFT 0.06 FT. (+0.03 FT. GH CORR. APPLIED)

MAX GH: 7.31 FT. AT 21:45 ON Jun. 07,2010 (+0.03 FT. GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
LAKE CREEK BELOW TWIN LAKES RESERVOIR
Water Year 2010

Location.--	Lat. 39°04'34", Long. 106°18'35", in NE $\frac{1}{4}$ SE $\frac{1}{4}$, sec. 22, T.11 S., R. 80 W., Lake County, on right bank 1.2 miles upstream from confluence of Lake Creek and Arkansas River and 1500 ft downstream of Twin Lakes Dam.
Drainage and Period of Record.--	N/A.
Equipment.--	Satellite-monitored data collection platform (Sutron high data rate SatLink DCP), shaft encoder, and stage-discharge recorder (Sutron SDR) in a concrete shelter and well. Shaft encoder and SDR are set to an inside electric tape-down mounted on instrument shelf. Outside staff gage installed in flume but generally used as backup to primary reference tape-down gage. Control is a 30-foot concrete Parshall flume.
Hydrologic Conditions.--	The gage is located approximately 400 ft downstream of the outlet of Twin Lakes Reservoir. The water released is warm enough the control does not experience ice affected days. No hydrologic condition changes were apparent this year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the Sutron SDR data log used for backup purposes. Record is complete and reliable for the entire year.
Datum Corrections.--	Levels were last run on Sept. 6, 2007. Results were well within allowable limits; no corrections were needed/ taken. For the five years prior to that levels results indicated the gage is very stable.
Rating.--	Control at all stages is a 30-ft. concrete Parshall flume. A standard 30 ft. Parshall flume table was used all year. It is well defined at all stages. Three discharge measurements (Nos. 124-126) were made this year ranging from 12.0 cfs to 1130 cfs. Measurements cover the range in stage experienced except for the lower mean daily flows on March 31, April 1 and 6; and the higher mean daily flows on May 30, June 5-9, and 15. The peak discharge of 1430 cfs occurred at 0830 June 6, 2010 at a gage height of 4.86 ft with a shift of 0.03 ft. The maximum gage height exceeded maximum measurement No. 125 by 0.91 ft. in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed using variable stage shift relationship, LAKBTLCCOSH04A. Measurement 124 was discounted 4% to fit this relationship. Measurements 125 and 126 were high flow measurements made with an ADCP and were not used for this record. See remarks for further information.
Special Computations.--	
Remarks.--	Wading measurements are made in the flume at the staff gage/ intake cross section. Eyebolts in the flume walls at this section are used to attach a safety cable with 2 ft. markings. The maximum flow that can be safely waded in the flume is about 250 cfs (gage height = 1.61 ft). Flows up to about 400 cfs (gage height = 2.20 ft) can be waded about 150 ft downstream of the flume. There is no bridge at this flume. Approximately 1,000 ft downstream is the Highway 82 bridge across Lake Creek. Conventional cable measurement from this bridge would be very difficult due to traffic and varying angle of flow caused by the bridge itself. This year two ADCP measurements were completed at the bridge location and near the peak flow. Results showed large positive shifts to the rating at these higher flows supporting a suspicion of increasing positive shifts as stage increases. At this time there are too few measurements above 400 cfs to confidently define the stage-shift relationship. Therefore these measurements were not used in the WY10 record but are reserved for future use. The current shift curve was developed using historical measurements of flow from zero to 400 cfs. The historical curve is applied in agreement with the USBR until the stage shift relation can be better defined. Overall this record is rated good, except for periods of flow above 400 cfs, which are rated fair, due to shift uncertainty. Station maintained and record developed by Cheston Hart.
Recommendations.--	Many measurements need to be made throughout the water year to define the stage-shift relationship between 400 cfs and 1000 cfs. Measurements should be made in the channel below the flume with the ADCP to avoid inclusion of any dam seepage flows in measurement.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LAKE CREEK BELOW TWIN LAKES RESERVOIR

RATING TABLE--

STD30FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

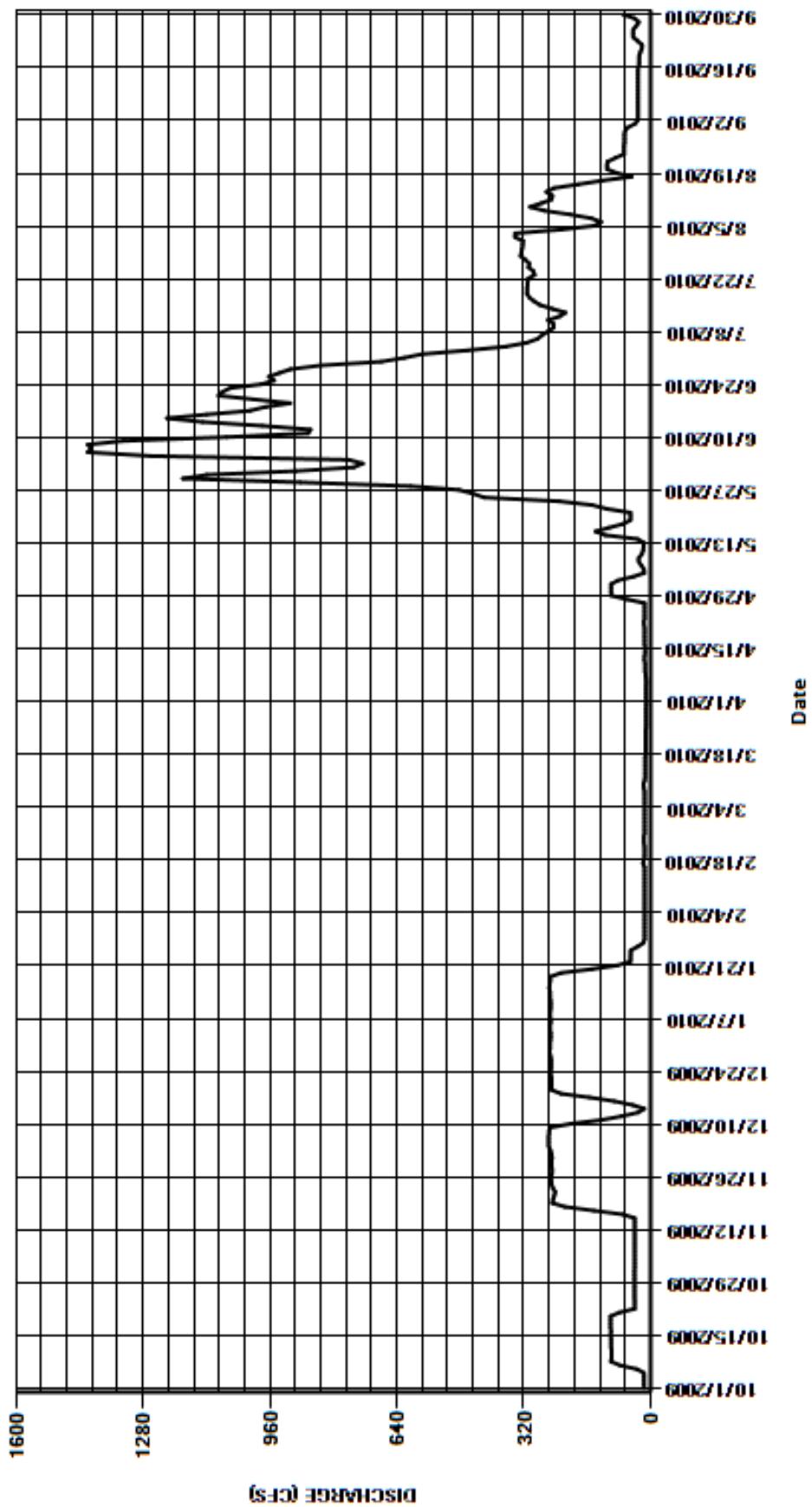
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	41	249	253	15	15	11	100	894	622	322	40
2	17	40	250	252	15	15	12	100	749	576	342	32
3	17	40	253	252	15	15	12	83	726	462	342	32
4	17	40	257	254	15	15	12	44	762	365	225	32
5	17	40	257	254	15	15	12	16	1260	313	142	32
6	35	40	257	252	15	15	11	17	1420	286	125	32
7	77	40	257	253	15	15	12	24	1410	274	150	32
8	100	40	256	254	15	15	13	30	1420	259	203	32
9	99	40	255	253	15	17	14	30	1330	245	268	32
10	99	40	202	252	15	18	14	22	1070	245	304	32
11	99	40	125	252	15	15	14	19	864	259	275	32
12	100	40	74	253	15	14	16	18	858	229	250	32
13	100	40	32	254	15	14	15	17	980	215	248	32
14	100	40	16	254	15	14	14	33	1130	248	263	32
15	101	40	46	256	15	14	14	114	1220	279	244	32
16	100	70	92	255	15	14	15	139	1120	294	182	31
17	101	143	154	253	19	14	15	105	1010	306	121	29
18	101	216	226	253	17	13	15	69	971	312	48	29
19	101	248	250	226	15	13	15	51	909	311	86	29
20	101	246	250	148	15	13	15	51	1000	311	110	26
21	79	243	250	84	15	13	16	51	1090	310	110	22
22	40	241	250	51	16	13	17	111	1080	309	109	22
23	40	247	252	51	17	13	15	148	1060	293	89	33
24	40	250	252	50	17	13	15	231	982	296	67	44
25	41	251	251	50	15	12	15	420	950	308	67	44
26	41	251	251	32	15	12	15	448	963	306	67	44
27	41	249	251	18	15	12	15	483	936	316	66	36
28	41	249	253	15	15	12	59	606	908	328	66	30
29	41	250	255	15	---	12	99	884	832	326	66	41
30	41	250	254	15	---	12	100	1180	679	324	65	70
31	41	---	254	15	---	11	---	1120	---	323	59	---
TOTAL	1985	4005	6531	5329	431	428	637	6764	30583	9850	5081	1018
MEAN	64	134	211	172	15.4	13.8	21.2	218	1019	318	164	33.9
AC-FT	3940	7940	12950	10570	855	849	1260	13420	60660	19540	10080	2020
MAX	101	251	257	256	19	18	100	1180	1420	622	342	70
MIN	17	40	16	15	15	11	11	16	679	215	48	22
CAL YR	2009	TOTAL	98143	MEAN	269	MAX	1320	MIN	16	AC-FT	194700	
WTR YR	2010	TOTAL	72642	MEAN	199	MAX	1420	MIN	11	AC-FT	144100	

MAX DISCH: 1430 CFS AT 08:30 ON Jun. 06,2010 GH 4.86 FT. SHIFT 0.03 FT.

MAX GH: 4.86 FT. AT 08:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAKE CREEK BELOW TWIN LAKES RESERVOIR
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07086000 ARKANSAS RIVER AT GRANITE
Water Year 2010

Location.--	Lat. 39°02'34", Long. 106°15'55", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T.11 S., R.79 W., Chaffee County, Hydrologic Unit 11020001, on right bank at Granite, 100 ft east of U.S. Highway 24, 100 ft downstream from county bridge, and 200 ft upstream from Cache Creek.
Drainage and Period of Record.--	427 mi ² . Sporadic data from April 1895 to May 1901. Complete data from April 1910 to current year. Monthly data for some periods only.
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sat-Link 2 DCP) and shaft encoder in 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside electric tape gage. Gage shelter is supplied with AC power. A stock tank heater is used inside the well during periods of freezing weather to keep well open. A cableway for high flow measurements is located approximately 100 feet downstream from gage.
Hydrologic Conditions.--	The Arkansas river at Granite is located below both Twin Lakes and Turquoise Lake. The flow conditions are subject to releases from these lakes as well as native flows. Natural drainage area is approximately 427 sq miles. The basin consists of high mountain terrain some of which is above tree line with very little development.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite with DCP log and chart record used for back-up purposes. The record is complete and reliable, except for the following periods: Dec. 9-19, 2009, Jan 4, 8, 25-31, Feb. 1-19, 22-28; Mar 1-7, 2010, when the stage-discharge relationship was affected by ice; Nov 30-Dec 3, 2009, when the gage well was frozen due float heater malfunction; and, August 20, 2010 when the gage was remodeled. The shelter and well are situated on the right bank in calm water subject to significant shore ice, including complete channel and control freeze-over during periods of freezing weather.
Datum Corrections.--	No levels were run this water year. Levels were last run Aug. 8, 2005.
Rating.--	Control is a boulder riffle 150 ft downstream. At high water stages channel and banks are the control. Rating No. 11A, was used this water year. It is well defined to 3000 cfs. Eleven discharge measurements (Nos. 383-393) were made during the water year ranging in discharge from 113 to 2850 cfs. They cover the range in flows experienced except for the lower daily flow of Dec 13-14, 2009; Jan 26-31; Feb 1-28; Mar 1-31; Apr 1-8, 2010 and higher flows of Jun 8, 2010. The peak flow of 2980 cfs occurred at 0700 on June 8, 2010 at a gage height of 5.68 ft with a shift of +0.25 ft. It exceeded mean stage of measurement No. 389, made June 9, 2010 by 0.08 ft. in stage.
Discharge.--	Shifting control method was used during all periods of ice-free record. Shift distribution was transitioned from the previous water using shift curve ARKGRCOV09 to the first measurement in this water year on November 9, 2009. After this, shifts were distributed using shift curve ARKGRCOV10 for the remainder of the water year. Measurements show shifts varying from -0.02 ft. to +0.25 ft. All were given full weight and applied directly, except for Meas. Nos. 384-386, 388 and 390-391 which were discounted from -1% to +7% to smooth shifts and shift curve transitions.
Special Computations.--	Discharge for periods of no gage-height record and ice-affected record was estimated on the basis of two measurements, surrounding good record, weather records, site visits and by using the final record from Lake Creek below Twin lakes. A hydrograph was used comparing flows with up and downstream gages. Multiple ADCP measurements were attempted both on the cableway and with temporary cable systems. These measurements indicate the ADCP is an effective method to measure the river at this site through the upper range of gage heights. Meas. 388 was confirmed with Meas. 389 to prove effectiveness at high water.
Remarks.--	Record good, except during periods of no gage height record and ice effect, which is poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	Continued use of the ADCP from the cableway should help confirm its effectiveness during the high water periods. Levels should be run this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07086000 ARKANSAS RIVER AT GRANITE

RATING TABLE--

ARKGRNCO11A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

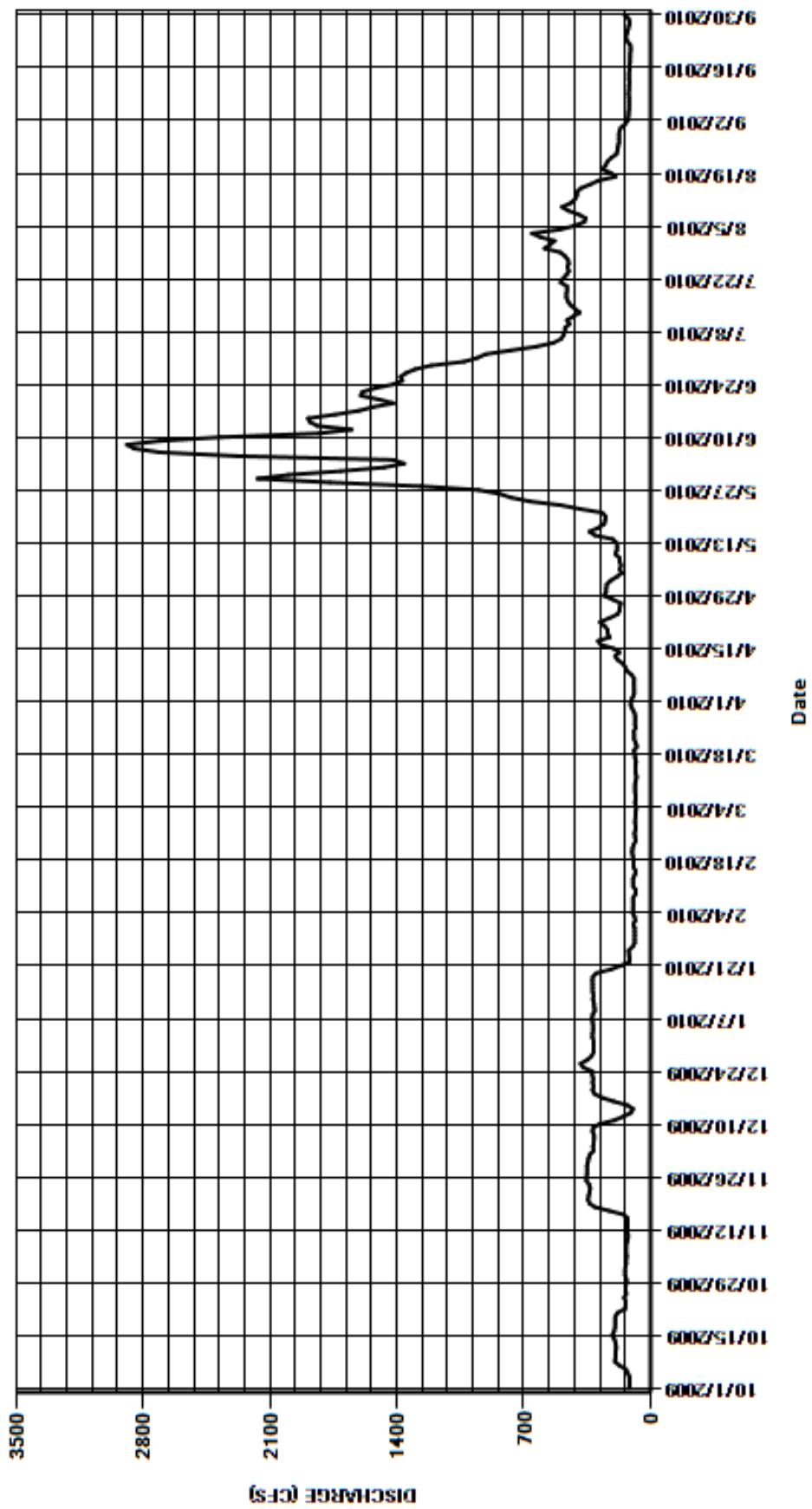
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	119	141	342	314	96	85	109	245	1710	957	530	140
2	115	140	334	322	84	84	100	242	1470	910	608	125
3	116	135	314	320	90	82	91	221	1360	773	654	123
4	117	135	318	318	99	80	91	187	1420	630	503	121
5	126	133	314	318	97	86	92	160	2280	537	422	120
6	136	135	313	320	96	84	93	171	2710	495	366	119
7	171	134	312	323	96	83	91	164	2850	481	358	119
8	197	134	320	320	97	86	104	170	2890	473	397	120
9	195	130	318	308	82	87	130	172	2710	472	454	121
10	193	125	282	311	82	86	139	195	2370	448	489	120
11	192	126	200	313	97	82	153	187	1830	462	442	119
12	191	127	150	318	97	78	182	185	1650	427	418	117
13	194	129	109	316	97	83	196	188	1840	391	408	119
14	200	128	97	319	88	85	171	209	1880	417	406	119
15	212	127	129	319	82	84	204	308	1890	442	384	118
16	202	148	204	319	94	81	275	338	1740	456	332	116
17	197	228	270	322	96	86	290	287	1610	465	287	115
18	195	308	310	319	94	88	226	257	1530	465	195	114
19	195	338	320	299	98	92	237	251	1420	461	219	113
20	195	346	315	218	102	76	238	248	1500	462	268	112
21	182	342	320	163	100	83	255	268	1600	497	248	111
22	141	337	317	117	94	91	279	392	1590	484	240	113
23	139	334	322	117	82	91	231	498	1520	465	218	130
24	138	340	323	120	86	93	185	668	1420	451	189	137
25	146	355	372	121	89	83	171	771	1370	459	183	131
26	135	353	387	99	84	87	170	834	1380	452	180	125
27	139	351	349	88	84	85	164	951	1350	456	175	120
28	140	350	326	89	86	85	209	1270	1300	473	175	115
29	131	351	315	88	---	90	257	1770	1210	499	175	123
30	135	346	315	89	---	101	246	2170	1030	585	173	147
31	141	---	314	89	---	110	---	2000	---	556	165	---
TOTAL	5025	6806	8931	7416	2569	2677	5379	15977	52430	16001	10261	3642
MEAN	162	227	288	239	91.8	86.4	179	515	1748	516	331	121
AC-FT	9970	13500	17710	14710	5100	5310	10670	31690	104000	31740	20350	7220
MAX	212	355	387	323	102	110	290	2170	2890	957	654	147
MIN	115	125	97	88	82	76	91	160	1030	391	165	111
CAL YR	2009	TOTAL	177380	MEAN	486	MAX	2490	MIN	96	AC-FT	351800	
WTR YR	2010	TOTAL	137114	MEAN	376	MAX	2890	MIN	76	AC-FT	272000	

MAX DISCH: 2980 CFS AT 07:00 ON Jun. 08,2010 GH 5.68 FT. SHIFT 0.25 FT.

MAX GH: 5.68 FT. AT 07:00 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086000 ARKANSAS RIVER AT GRANITE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
Water Year 2010

Location.--	Lat. 39°01'05", Long. 106°16'38", in SE $\frac{1}{4}$ sec. 12, T, 12 S., R. 80 W., Chaffee County, Hydrologic Unit 11020001, on right bank 0.5 mi upstream from water line of Clear Creek Reservoir at elevation 8,875 ft, 1.5 mi downstream from unnamed tributary, and 1.9 mi southwest of Granite.
Drainage and Period of Record.--	67.1 mi ² .
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron high data rate SatLink Logger DCP) and shaft encoder in a 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside drop tape gage with adjustable RP on instrument shelf. Control is a concrete dam tapered lower towards the center, located approximately 10 feet downstream. An outside staff gage is used as a supplemental reference gage. However, since its installation, it does not agree with the inside tape, most likely due to draw-down. No changes this water year.
Hydrologic Conditions.--	Clear Creek fills Clear Creek Reservoir and is tributary to the main stem of the Arkansas River. Clear Creek basin is approximately 42,880 acres with a mean elevation of 11,700 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except a low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the chart record used for back-up purposes. The record is complete and reliable, except for the following periods: October 26, 31, 2009, April 6-7, 2010 when the stage-discharge relationship was affected by ice; Nov. 15, 2009 to April 5, 2010, when the station was closed for the winter; and May 29, 2010, when a log was temporarily lodged on the control causing backwater.
Datum Corrections.--	Levels were last run on Aug 19, 2009. No corrections were needed/ taken.
Rating.--	The control is a concrete dam tapered lower towards the center and located 10 ft below the gage. Control at high stages includes brush and boulders lining the edges of the channel. Rating No. 14, dated 20 Feb 1996, was used for the entire water year. Ten discharge measurements (Nos. 100-109) were made during the water year, ranging in discharge from 9.79 to 493 cfs. They cover the range in stage experienced, except for the higher daily flows of June 5-9, 2010. The peak flow of 1310 cfs occurred at 2345 June 6, 2010 at a gage height of 5.26 ft with a shift of +0.04 ft. It exceeded measurement No. 107, made June 9, 2010, by 0.77 ft. in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were applied by time and event from Oct 1, 2009 thru May 3, 2010. From May 3, 2010 to June 1, 2010 shifts were applied using variable stage-shift relationship CCACCRCOVS10A. From June 1, 2010 thru Sept 30, 2010 shifts were applied by time and event. Open water measurements indicated shifts varying from +0.04 to +0.20 ft. All open water measurements were given full weight and applied directly.
Special Computations.--	Discharge for periods of no gage-height record and ice-affected record was estimated on the basis of four measurements (Nos. 100-103) and temperature records from Clear Creek Reservoir. Use of the ADCP was attempted and found to have issues with both the limited depth during normal flows and high velocities during peak flows. ADCP usage will be limited at this site. One successful measurement was made from the hiking bridge during high water. On May 29, 2010 a log jammed on the control and affected the GH. GH was adjusted per the notes on the chart and an email from Rick Sexton.
Remarks.--	Record good, except during periods of no gage height record and ice effect, which are estimated and poor; and the period when the log jammed on the control which is estimated and fair. After inspection it was noticed that a large chunk of the control, near the middle, has broken off. This has contributed to the higher positive shifts since its occurrence. Station maintained and record developed by Cheston Hart.
Recommendations.--	More documentation of the weir condition is needed to track damage and wear that the weir is exhibiting. A new rating should be considered but if the weir continues to change a new structure may be needed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR

RATING TABLE--

CCACCRCO14 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	18	12	12	11	12	15	30	400	104	121	45
2	24	18	11	11	11	11	14	28	337	103	119	43
3	24	18	10	12	11	12	14	26	299	99	128	42
4	24	18	11	11	13	12	12	29	370	91	105	40
5	26	17	11	12	13	12	10	34	620	85	113	39
6	24	17	10	14	12	12	9	36	781	80	106	38
7	24	17	10	12	12	12	15	32	788	75	92	37
8	24	17	11	12	11	11	17	35	631	73	89	38
9	23	16	10	14	11	13	17	35	596	74	84	44
10	22	16	11	14	10	13	16	44	453	68	85	39
11	22	16	11	15	11	13	15	43	300	66	76	37
12	20	16	12	14	13	13	18	43	254	75	83	36
13	22	16	13	14	13	14	18	43	220	68	86	34
14	23	16	12	15	11	12	16	45	178	63	75	33
15	24	15	11	14	10	13	18	47	155	60	69	32
16	22	15	11	14	11	14	22	44	162	57	70	31
17	21	15	13	13	12	15	28	45	164	55	80	30
18	21	15	11	14	12	15	25	48	166	54	68	29
19	22	15	10	14	12	15	28	48	166	51	66	29
20	21	15	12	13	12	12	35	49	167	50	74	29
21	23	15	12	13	12	14	42	62	159	52	66	30
22	21	15	11	13	11	14	50	83	151	51	61	31
23	21	14	12	13	10	15	43	101	140	50	59	37
24	20	13	12	13	11	15	36	137	138	47	57	33
25	21	14	12	14	13	15	32	97	135	46	55	30
26	20	14	11	14	10	15	31	117	130	44	51	29
27	19	14	11	14	10	15	31	193	125	43	49	27
28	18	13	11	13	11	16	35	324	118	50	48	27
29	17	13	12	13	---	16	35	440	113	53	49	26
30	16	12	12	13	---	16	33	428	108	69	49	25
31	18	---	11	12	---	15	---	385	---	66	48	---
TOTAL	672	463	350	409	320	422	730.0	3151	8524	2022	2381	1020
MEAN	21.7	15.4	11.3	13.2	11.4	13.6	24.3	102	284	65.2	76.8	34
AC-FT	1330	918	694	811	635	837	1450	6250	16910	4010	4720	2020
MAX	26	18	13	15	13	16	50	440	788	104	128	45
MIN	16	12	10	11	10	11	9	26	108	43	48	25

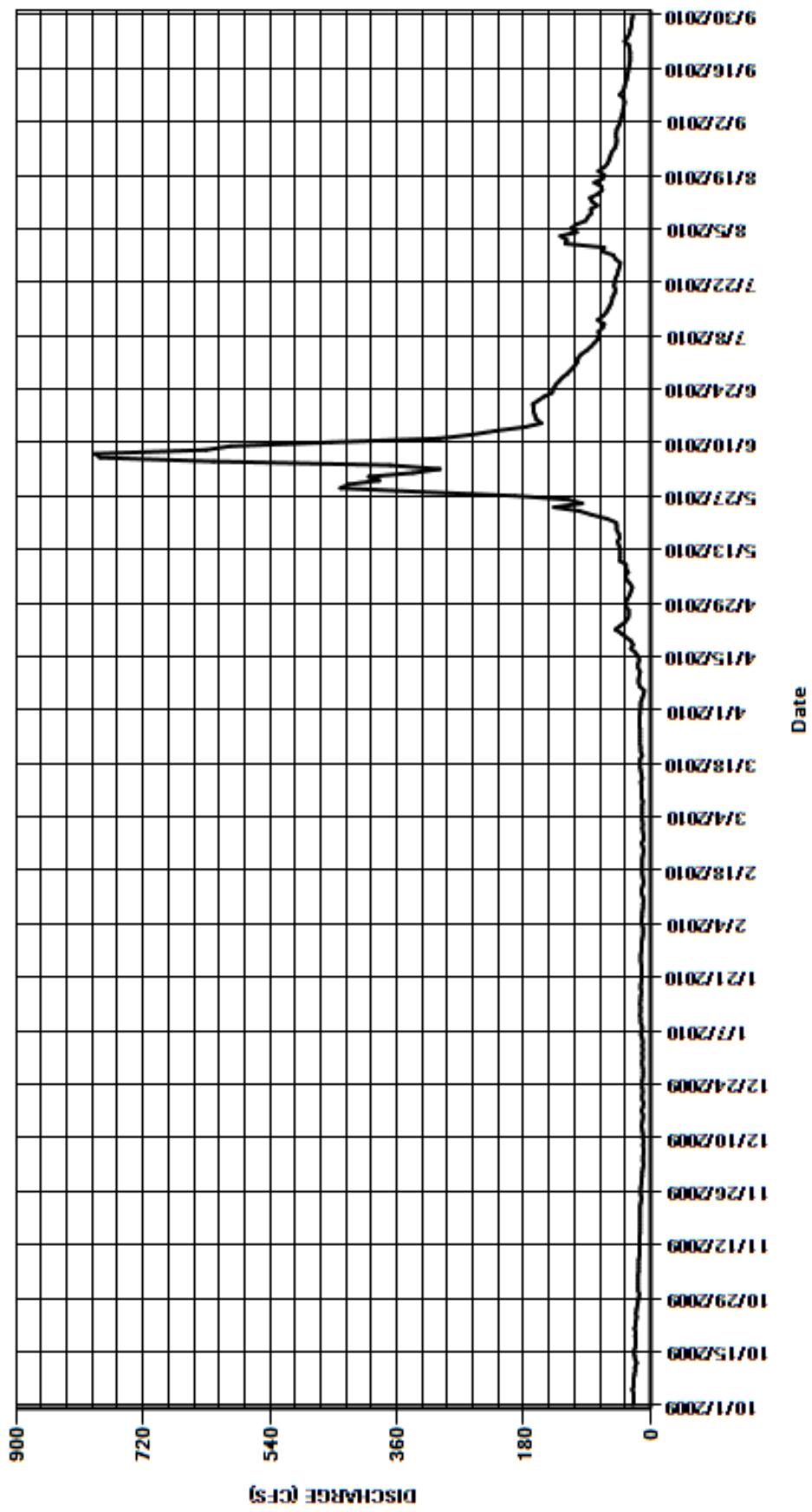
CAL YR	2009	TOTAL	22004.0	MEAN	60.3	MAX	411	MIN	9	AC-FT	43640
WTR YR	2010	TOTAL	20464.0	MEAN	56.1	MAX	788	MIN	9	AC-FT	40590

MAX DISCH: 1310 CFS AT 23:45 ON Jun. 06,2010 GH 5.26 FT. SHIFT 0.04 FT.

MAX GH: 5.26 FT. AT 23:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
Water Year 2010

Location.--	Lat. 39°01'20", Long. 106°14'07", Lake County, on left bank 200 ft. upstream from junction Clear Creek and Arkansas River.
Drainage and Period of Record.--	68.98 sq. mi.
Equipment.--	High-Data-Rate, Sutron Sat-Link 2 data collection platform and shaft encoder in a wood frame shelter and concrete stilling well. A Sutron Stage Discharge Recorder (SDR) is used for backup purposes. The shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside gage is used as supplemental reference. A bridge is located across the concrete section at the entrance to the converging section of the flume and used for making high water measurements.
Hydrologic Conditions.--	The gage is located approximately 1500 ft downstream of the outlet of Clear Creek Reservoir. The stream flows under the highway approximately 200 ft above the gage through three separate 6 ft diameter culverts. During the winter the water flows solely in the south culvert where winter flows are measured. The water released is warm enough the control does not experience ice affected days. No hydrologic conditions changes were apparent this year.
Gage-Height Record.--	Primary record is hourly averages of fifteen-minute satellite data with the SDR log used for backup purposes. Record is complete and reliable. Several days during the year experienced from one to sixteen missing unit values. These were filled in without loss of accuracy.
Datum Corrections.--	Levels were last run on July 14, 2006. No corrections were required and level results in previous years have shown this gage to be stable.
Rating.--	The control is a 20-ft wide, compound, broad crested weir constructed in 1993. Rating No. 4 was used all year. It is well defined to about 350 cfs. Seven discharge measurements (Nos. 233-239) were made during the year. Measurements range in discharge from 0.91 to 318 cfs. They cover the range in stage except lower flows of Nov 21, 2009 thru April 21, 2010 and higher flow days of May 29, 30; June 5-7, 10-12, 2010. The peak flow of 362 cfs occurred at 0715 May 30, 2010 at a gage height of 3.19 ft with a shift of -0.08 ft. It exceeded the stage of measurement No. 236 made June 1, 2010, by 0.18 ft.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time with consideration of stage. The ending WY09 shift of 0.04 ft was continued for the period 0000 Oct 1 to 2355 Nov 14, 2009, a relatively stable gage height period. A shift of 0.05 ft found with Msmt 233 on Nov 18 was applied for the entire winter low flow period from 0000 Nov 15 2009 to 1600 April 29 2010. Historical shifts during the low flow winter period have shown this higher positive shift trend. Two variable stage shift relationships were defined and applied: CCBCCRSF10A, based on Msmts 234 to 236, was applied to the rising leg and high flow period of the release hydrograph from 1700 Apr 29 to 0800 June 13 2010; and CCBCCRSF10B, based on Msmts 235-239, was applied to the receding leg of the release hydrograph from 0900 June 13 until the end of the water year. Measurement shifts ranged from -0.11 ft to 0.05 ft. All measurements were given full weight except for No. 235 and Nos. 237-239, which were discounted between -3% and 7% to smooth shift distribution.
Special Computations.--	No special computations were used this year.
Remarks.--	Record is good, except for the winter low flow period: Nov 15, 2009 to Apr 29, 2010, which is fair due to difficulty measuring the low flows and defining shifts. Larger positive shifts during winter are due to leaks within the weir. Currently the control weir is constructed from two railroad ties with a shaped metal plate on top. Over the past few years these have started to leak and show signs of aging. Varying shifts this year could be the result of use of the ADCP as the primary tool for measurements. At high flows the weir causes abnormal velocity profiles, where the velocities at 0.2 and 0.8 depths tend to be the same throughout a measurement. The ADCP can better resolve actual velocities under such flow conditions and in turn be more accurate. Its use at this site should continue to be refined. Station maintained and record developed by Cheston Hart.
Recommendations.--	Repair to weir should be completed as it appears the leaks have increased this water year. Continue use of the ADCP should be attempted at this site. Run levels.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR

RATING TABLE--

CCBCCR004 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

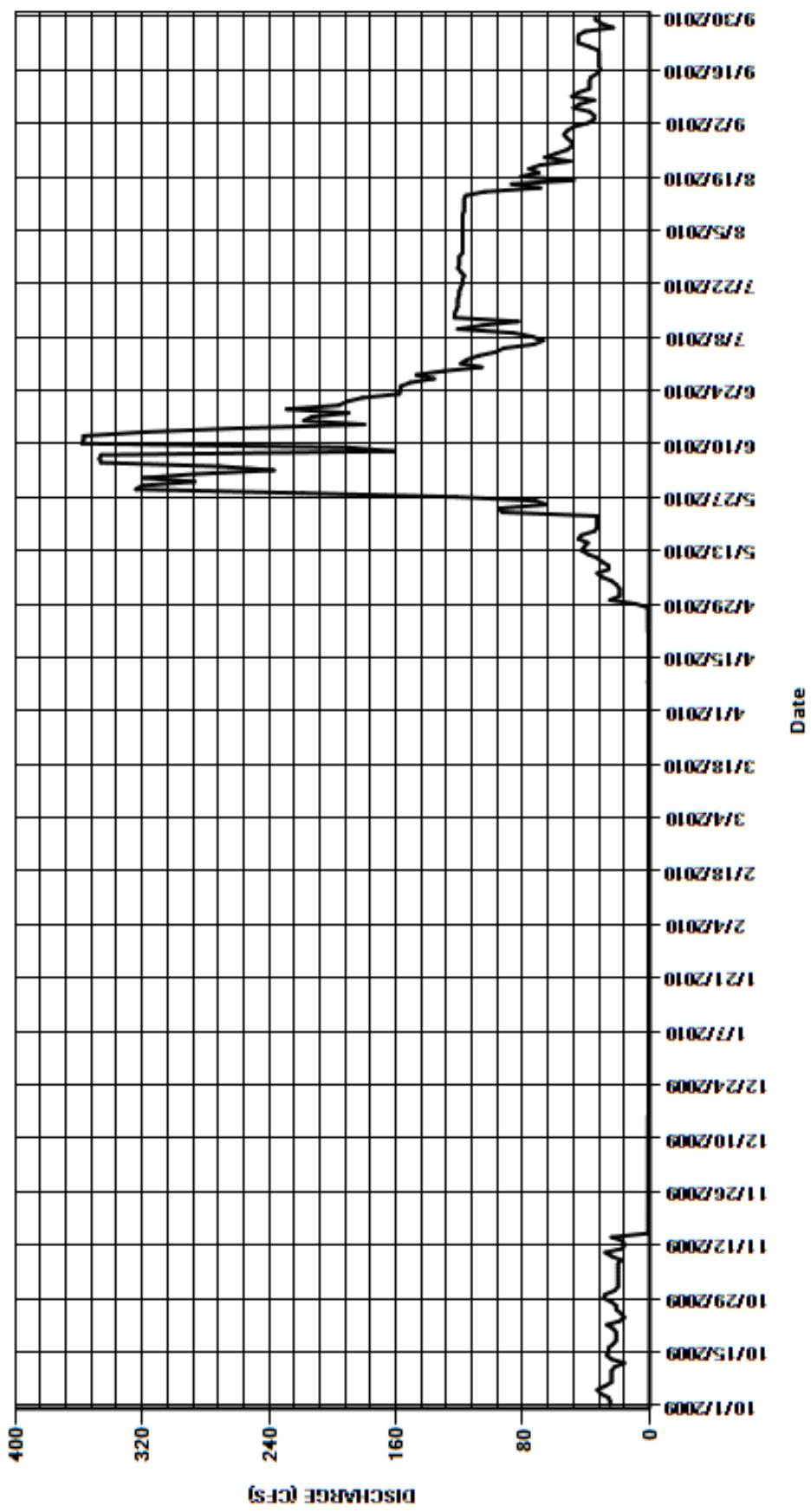
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	20	0.85	0.78	0.7	0.6	0.66	19	319	119	118	48
2	25	20	0.85	0.78	0.66	0.6	0.66	19	287	115	118	39
3	26	20	0.85	0.78	0.66	0.6	0.66	19	237	108	118	35
4	31	20	0.85	0.76	0.66	0.6	0.66	21	271	97	118	35
5	33	20	0.85	0.72	0.66	0.6	0.66	24	346	92	118	38
6	28	20	0.85	0.72	0.66	0.58	0.71	30	347	73	118	48
7	24	20	0.85	0.72	0.66	0.56	0.8	33	346	67	118	44
8	24	18	0.85	0.72	0.66	0.55	0.84	26	161	74	118	35
9	24	24	0.85	0.72	0.66	0.55	0.84	26	191	86	118	49
10	24	28	0.85	0.72	0.66	0.55	0.79	30	358	121	117	45
11	22	17	0.85	0.72	0.66	0.57	0.76	33	357	105	117	38
12	16	16	0.85	0.72	0.66	0.6	0.74	39	357	83	117	38
13	24	17	0.85	0.72	0.66	0.6	0.74	43	318	123	117	38
14	27	24	0.85	0.72	0.68	0.59	0.76	41	259	123	116	37
15	26	1.1	0.85	0.72	0.71	0.55	0.75	39	180	122	104	33
16	26	0.96	0.83	0.71	0.68	0.56	0.77	45	218	121	69	31
17	23	0.92	0.78	0.7	0.64	0.58	0.77	43	213	121	87	32
18	21	0.92	0.78	0.72	0.6	0.56	0.75	35	190	121	48	32
19	21	0.92	0.78	0.72	0.6	0.57	0.73	33	229	120	81	32
20	21	0.92	0.78	0.72	0.6	0.55	0.74	33	196	120	70	32
21	23	0.88	0.76	0.72	0.6	0.55	0.76	33	191	119	76	32
22	27	0.89	0.72	0.7	0.6	0.55	0.95	33	181	118	69	38
23	19	0.85	0.72	0.66	0.6	0.55	0.99	93	158	118	50	45
24	16	0.85	0.74	0.71	0.6	0.55	0.99	95	157	117	66	45
25	18	0.85	0.78	0.72	0.62	0.55	0.99	65	157	119	59	45
26	21	0.85	0.78	0.72	0.65	0.55	1	72	151	121	52	41
27	21	0.85	0.78	0.72	0.6	0.55	1	122	136	120	49	23
28	24	0.85	0.78	0.72	0.62	0.56	1.1	219	147	120	49	30
29	29	0.85	0.78	0.66	---	0.6	9.1	324	130	120	52	34
30	28	0.85	0.78	0.66	---	0.67	25	320	106	118	54	34
31	22	---	0.78	0.68	---	0.69	---	287	---	118	52	---
TOTAL	739	298.31	25.10	22.26	18.02	17.89	56.67	2294	6894	3419	2733	1126
MEAN	23.8	9.94	0.81	0.72	0.64	0.58	1.89	74	230	110	88.2	37.5
AC-FT	1470	592	50	44	36	35	112	4550	13670	6780	5420	2230
MAX	33	28	0.85	0.78	0.71	0.69	25	324	358	123	118	49
MIN	16	0.85	0.72	0.66	0.6	0.55	0.66	19	106	67	48	23
CAL YR	2009	TOTAL	20711.85	MEAN	56.7	MAX	381	MIN	0.66	AC-FT	41080	
WTR YR	2010	TOTAL	17643.25	MEAN	48.3	MAX	358	MIN	0.55	AC-FT	35000	

MAX DISCH: 362 CFS AT 07:15 ON May. 30,2010 GH 3.19 FT. SHIFT -0.08 FT.

MAX GH: 3.19 FT. AT 07:15 ON May. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07089250 COTTONWOOD CREEK NEAR BUENA VISTA
Water Year 2010

Location.-- Lat. $38^{\circ}50'04''$, Long. $106^{\circ}07'20''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$, sec. 16, T.14 S., R. 78 W., in Chaffee County, on left bank, about 1500 ft. upstream from Arkansas River, and 1200 ft. upstream from bridge at Buena Vista High School.

Drainage and Period of Record.-- 109.24 sq.mi.

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink Logger high data rate DCP) and shaft encoder in a 42-inch corrugated metal pipe shelter and well. Primary reference gage is inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage used for supplemental reference. On April 30, 2010 a Sutron stage discharge recorder was installed and the chart recorder removed. A Constant Flow Bubbler was installed as additional backup. No additional changes this water year.

Hydrologic Conditions.-- Cottonwood Creek is tributary to the main stem of the Arkansas River. The Cottonwood Creek basin is approximately 108 sq miles with a mean elevation of 10,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. The creek does flow through the town of Buena Vista including a small pond that is about one surface acre. In the fall this pond is drained and large amounts silt and sand are released filling most of the channel including the control. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is hourly averages of fifteen minute satellite data with chart, SDR and CFB backup record. The record is complete and reliable, except for the following periods: Dec 4-19 2009, when ice affected the stage-discharge relationship, and Dec 20, 2009-April 1, 2010; when the well was frozen and no effective GH was available.

Datum Corrections.-- Levels were last run on Aug. 18, 2009. Results were well within acceptable limits, so no corrections were made at that time.

Rating.-- The control is a concrete broad-crested, compound weir, with a center V-notch for low flow. Rating No. 4, dated Mar. 25, 1996, was used the entire water year, and is well defined to about 676 cfs. Eleven discharge measurements (Nos. 736-746) were made during the year. Measurements ranged in discharge from 1.10 to 47.0 cfs. They cover the range in stage experienced except for the lower daily flows of July 20, 2010 and the higher daily flows of April 16, 21-23 May 23, 24, 26-31, June 1-22, Aug 3, 2010. The peak discharge of 386 cfs occurred at 0030 on June 6, 2010 at a gage height of 4.16 ft with a shift of -0.03 ft. It exceeded the mean stage of measurement No. 742, made June 22, 2010 by 1.64 feet.

Discharge.-- Shifting control method was used for periods of good, ice-free record. Shifts were applied as defined by measurements and distributed by time for the entire water year. Many fill and scour events are assumed to cause varied shifts especially in the spring and fall when the city lake releases. Shifts ranged from -0.07 to +0.04 feet. All shifts were applied directly and given full weight, except Msmt 736 which was discounted -5% to smooth shift distribution.

Special Computations.-- Estimation of discharge for periods of ice effect and no gage height were made using surrounding good record, partial day records, weather records and discharge measurements. A hydrograph was used.

Remarks.-- Record good, except during periods of ice effect or when the well was frozen, which are estimated and poor. Due to lack of recent high measurements to verify the upper end of the rating, flows in excess of 72 cfs (150% of the high flow measurement made in WY10) and the peak for WY10 are rated fair. Many attempts to keep this well open were tried with using an oil cylinder and constant chopping out floats but eventually the inlets became frozen making it impossible to get good record. Ice measurements proved to be very difficult as the stream became completely covered with very little velocity to carry ice away from control causing backup and changing measurement section during measurements. Station maintained and record developed by Cheston Hart.

Recommendations.-- Additional measurements need to be made during periods of ice effect and no record for estimation purposes. Attempt to use CFB as primary record and possibly abandon well. Run levels on the control to better define gage height range for flows in the low flow notch.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07089250 COTTONWOOD CREEK NEAR BUENA VISTA

RATING TABLE--

COCRBVCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	27	22	21	20	20	22	24	175	32	41	3
2	1.4	29	22	21	20	19	21	21	150	29	42	2.9
3	1.5	29	22	22	21	19	20	18	134	28	48	2.9
4	2.7	28	21	21	21	20	20	13	159	26	39	2.8
5	3.4	28	21	21	21	20	19	9.5	268	23	45	2.8
6	2.9	27	23	21	21	20	18	7.8	317	18	35	2.8
7	3.1	27	22	21	20	21	19	5.4	287	16	25	2.9
8	4.3	27	22	20	20	21	22	5	249	15	19	3.1
9	5.4	26	22	20	18	22	24	4.3	225	10	17	3.2
10	5.6	24	22	20	19	21	28	10	199	8.5	15	3.1
11	5.4	23	23	20	20	20	32	7.1	164	7.4	13	3
12	5	23	23	22	20	19	40	12	161	8.3	14	2.9
13	6.1	24	23	22	20	19	40	10	156	5.9	14	2.9
14	9.9	24	24	22	21	20	32	7.5	124	3.8	9.1	2.9
15	10	23	24	22	19	19	37	5.4	103	3.1	7.9	2.9
16	9.3	18	24	21	20	20	48	3.5	94	2.3	8.6	2.9
17	9.2	22	24	21	21	21	46	3.5	83	1.8	16	2.9
18	8.7	24	23	22	22	21	39	3.7	76	1.6	9.4	2.8
19	8.9	23	23	22	22	21	39	3.9	71	1.3	6.6	2.7
20	8.5	22	22	21	23	17	43	3.6	61	0.88	11	2.7
21	12	22	22	21	24	17	56	10	52	1.5	8	2.8
22	12	22	21	21	21	18	73	28	48	3	5.2	2.8
23	11	21	21	20	20	19	54	60	44	3.5	3.4	2.8
24	11	19	20	20	19	19	41	80	41	3.7	3.1	2.8
25	10	22	20	22	18	18	35	34	37	3.6	3.1	2.7
26	6.7	23	20	21	19	18	32	54	37	3.6	3	2.6
27	9.9	23	20	21	20	19	29	106	36	3.6	2.8	2.5
28	17	23	21	22	20	20	34	170	39	4	2.6	2.4
29	9.5	22	21	22	---	21	34	249	43	4.5	2.6	2.4
30	17	22	22	21	---	22	26	208	35	9	2.7	2.3
31	25	---	22	21	---	22	---	179	---	11	2.8	---
TOTAL	255.6	717	682	655	570	613	1023	1356.2	3668	292.88	474.9	84.2
MEAN	8.25	23.9	22	21.1	20.4	19.8	34.1	43.7	122	9.45	15.3	2.81
AC-FT	507	1420	1350	1300	1130	1220	2030	2690	7280	581	942	167
MAX	25	29	24	22	24	22	73	249	317	32	48	3.2
MIN	1.4	18	20	20	18	17	18	3.5	35	0.88	2.6	2.3

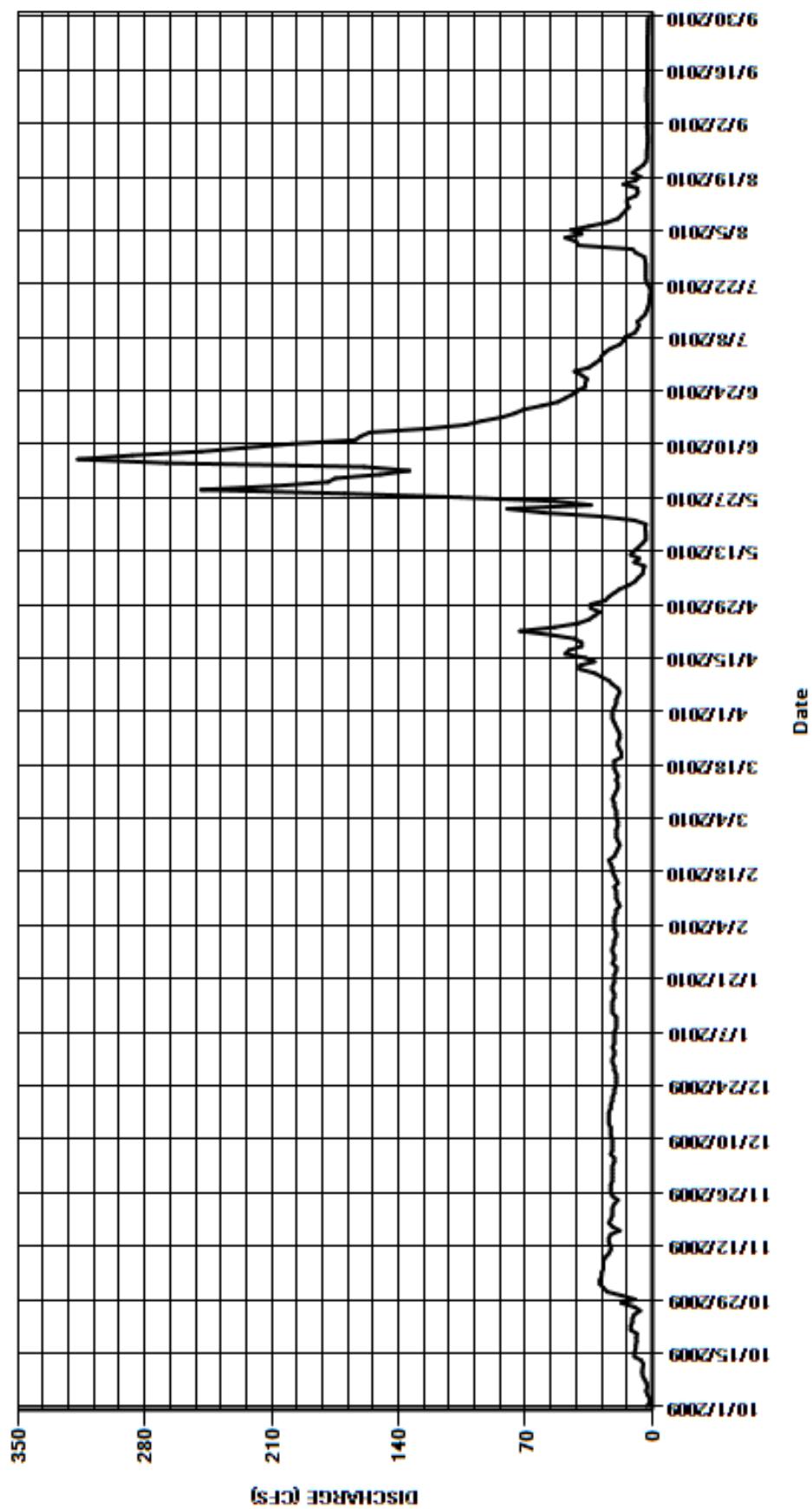
CAL YR	2009	TOTAL	10278.6	MEAN	28.2	MAX	159	MIN	1.4	AC-FT	20390
WTR YR	2010	TOTAL	10391.78	MEAN	28.5	MAX	317	MIN	0.88	AC-FT	20610

MAX DISCH: 386 CFS AT 00:30 ON Jun. 06,2010 GH 4.16 FT. SHIFT -0.03 FT.

MAX GH: 4.16 FT. AT 00:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07089250 COTTONWOOD CREEK NEAR BUENA VISTA
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07091000 CHALK CREEK AT NATHROP
Water Year 2010

Location.--	Lat. 38°44'30", Long. 106°04'57", in SW¼SE¼NE¼SW¼ sec. 14, T.15 S., R.78 W., Chaffee County, on left bank, 640' north of the Junction of Co. Hwy. 162 and U.S. 285 on the frontage rd. parallel to U.S. 285, ¼ mi. south of Nathrop, Co., and 1 mi. west of the confluence of Chalk Creek and the Arkansas River.
Drainage and Period of Record.--	88.74 sq. mi.
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink2 Logger HDR DCP) and shaft encoder in 32-inch diameter corrugated metal pipe (CMP) shelter and well w/ precipitation gage. Shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage is also used for reference purposes. Control is a concrete dam, tapered lower towards the center, located approximately 5 feet downstream. DCP replaced on August 3, 2010 and August 20, 2010. No other changes this water year.
Hydrologic Conditions.--	Chalk Creek is tributary to the main stem of the Arkansas River. The Chalk Creek basin is approximately 88.5 sq miles with a mean elevation of 11,200ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP and SDR logs and chart record as backup. Record is complete and reliable except for the following periods: December 4, 9-11, 25-27 2009; January 8; February 15, 23-24, 2010 when ice affected the stage-discharge relationship; June 5-6, 2010, when the control was backwater affected due to a log jammed in the highway culverts just below the control; and, August 3, 2010 when 6 – 15 minute unit values were replaced using adjacent good data and linearly interpolating.
Datum Corrections.--	Levels were run on August 18, 2009. Results were well within acceptable limits, so no corrections were needed/ taken.
Rating.--	The low concrete dam is the control at all stages, except at higher stages the webbed box culvert (~ 75 ft. downstream) under the highway will sometimes cause backwater and affect the rating. Rating No. 7 (dated Jan. 19, 2006) was used the entire water year, and is well defined to about 1000 cfs. Eight discharge measurements (Nos. 741-747) were made during the year. Measurements ranged in discharge from 18.9 to 111 cfs. They cover the range in flows experienced, except for many low flow days and the higher daily flows of May 23 - June 19, 2010. The peak flow is undetermined but estimated to have occurred at 0045 on June 6, 2010 at a backwater affected gage height of 9.15 ft. Tpeak flow is undetermined due to a log jam below control.
Discharge.--	Shifts were distributed by stage for the entire water year of good record. Shifts were applied as defined by measurements and were distributed by time for the entire water year. Shifts ranged from -0.07 to +0.06 ft. Measurement nos. 743 was discounted 5% to smooth distribution.
Special Computations.--	Multiple ADCP measurements were attempted during high water season but unfortunately this river has high sediment load causing inconsistent readings from the Acoustic equipment. The log that jammed on the bridge abutment and culvert just below the control was during the peak flow for the Water Year. This event happened during the middle of the night on weekend so no measurements were made but the hydrologist was in the area and noted the high water mark on an upstream bridge. According to that mark and locals this was the highest point the river reached this water year. No peak discharge could be found but using the days surrounding the peak the daily discharge could be estimated. The peak event in June was analyzed using an event based shift distribution and by examination of the artificial control shifting prior to and after the peak per S.E. Rantz publication 2175 and proration of shift from 5/12/2010 to 6/22/2010 with the assumption that scour occurred to some degree on the ascending limb as well as the descending limb of the peak event. Ice affected days were estimated using a gage height trace along with Buena Vista NOAA air temperature data to find and smooth out ice spikes.
Remarks.--	Record is considered good, except during periods of ice effect and estimated flow days during the log jam, which are poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	Complete more measurements at this gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07091000 CHALK CREEK AT NATHROP

RATING TABLE--

CHCRNAC07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

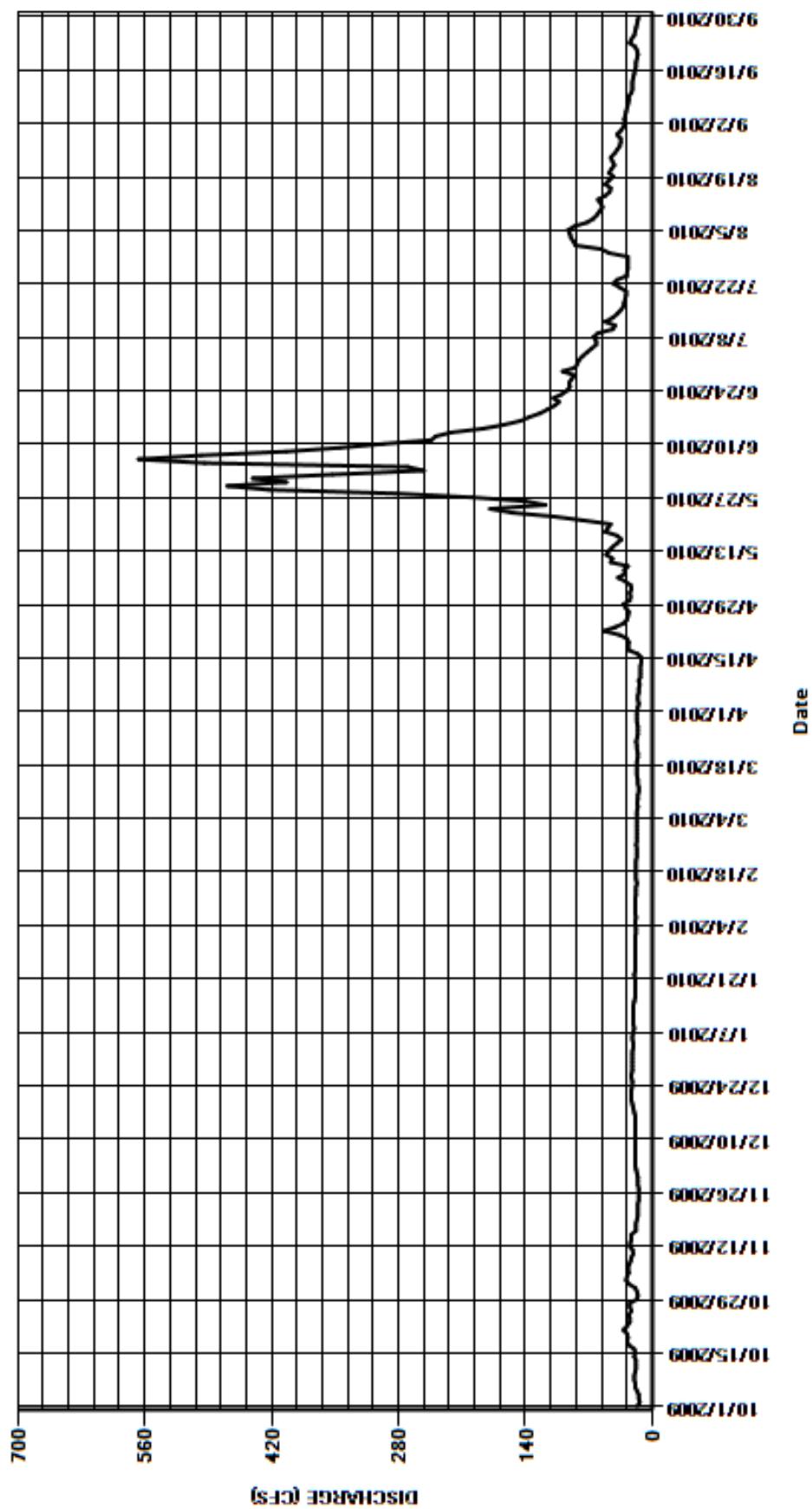
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	19	17	22	19	17	17	24	441	83	85	32
2	14	26	18	22	18	17	16	25	353	81	87	30
3	15	29	19	21	18	17	15	23	252	77	90	31
4	15	28	19	21	19	17	16	24	270	72	91	30
5	17	26	19	22	19	17	16	30	494	67	93	29
6	19	27	19	22	18	17	15	38	567	62	86	28
7	19	26	19	21	19	16	15	30	498	62	72	27
8	20	24	19	20	19	17	14	31	404	65	65	26
9	20	23	19	21	19	16	15	27	345	60	61	26
10	19	21	19	21	19	16	13	46	297	44	58	23
11	18	22	19	21	19	15	13	44	244	41	55	22
12	18	25	19	21	18	15	13	51	239	52	57	22
13	18	24	19	21	18	16	13	48	222	44	60	22
14	20	23	19	21	18	16	12	44	187	39	52	21
15	19	23	19	20	17	17	12	39	164	35	47	20
16	20	18	19	19	18	17	16	34	146	32	46	19
17	26	18	20	19	18	17	26	39	136	31	52	18
18	28	18	21	19	18	17	27	52	124	30	48	18
19	27	17	22	19	18	17	26	49	116	29	43	17
20	28	16	23	19	18	16	28	46	108	29	48	16
21	32	16	23	19	18	16	36	77	103	36	45	17
22	28	16	23	20	17	17	54	109	109	43	42	19
23	25	16	23	19	17	17	41	155	100	39	44	25
24	25	15	22	19	17	18	32	179	94	28	46	23
25	26	15	22	19	18	17	28	118	91	28	42	20
26	23	15	23	19	17	16	27	140	92	27	39	19
27	25	15	23	19	17	16	26	198	89	27	36	18
28	25	16	22	19	17	16	29	281	86	27	35	17
29	17	16	22	19	---	17	32	423	99	27	35	16
30	16	16	22	19	---	17	25	469	85	48	39	15
31	17	---	22	19	---	17	---	404	---	56	35	---
TOTAL	656	609	634	622	505	514	668	3297	6555	1421	1734	666
MEAN	21.2	20.3	20.5	20.1	18	16.6	22.3	106	218	45.8	55.9	22.2
AC-FT	1300	1210	1260	1230	1000	1020	1320	6540	13000	2820	3440	1320
MAX	32	29	23	22	19	18	54	469	567	83	93	32
MIN	14	15	17	19	17	15	12	23	85	27	35	15
CAL YR	2009	TOTAL	18773.0	MEAN	51.4	MAX	368	MIN	5.1	AC-FT	37240	
WTR YR	2010	TOTAL	17881	MEAN	49	MAX	567	MIN	12	AC-FT	35470	

MAX DISCH: (not determined)

MAX GH: 9.15 FT. AT 00:45 ON Jun. 06,2010 (backwater affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091000 CHALK CREEK AT NATHROP
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07091500 ARKANSAS RIVER AT SALIDA
Water Year 2010

Location.--	Lat. 38°32'45", Long. 106°00'36", in NE $\frac{1}{4}$ sec. 31, T.50 N., R.9 E., Chaffee County on right bank at Salida, 450 ft. upstream from bridge on State Highway 291, and 2.7 mi. upstream from South Arkansas River.
Drainage and Period of Record.--	1,218 mi ² .
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron Model Satlink 2 DCP high data rate transmitter) and shaft encoder in a 4 ft x 4 ft steel shelter placed over a CMP stilling well. Shaft encoder and chart set to inside drop tape from an adjustable RP on instrument shelf. Cableway approximately 35 feet downstream from gage. No changes this water year.
Hydrologic Conditions.--	The Arkansas River at Salida is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural Drainage area is approximately 1200 sq miles with a mean elevation of 10300 ft. The basin consists of high mountain terrain some of which is above tree line.
Gage-Height Record.--	The primary record is hourly averages of fifteen minute DCP log data with satellite data and chart record used for back-up. Record is complete and reliable, except for the following periods: Nov 26-30, Dec 1-4, 7, 8, 15-19, 27, 28, 2009, Jan 2-16, 26-28, 30-31, Feb 1-3, 5-7, 9-18, 22-27, Mar 20-21, 2010, when gage height was affected by ice on the control.
Datum Corrections.--	Levels were last run on Feb 26, 2009. The drop tape was adjusted due to the RP being moved when the shelf was replaced.
Rating.--	The control consists of placed boulders 80 ft downstream of gage which affect flow at all range of stages. Heavy brush on both banks also affects flows at high stages. Rating No. 30, dated August 26, 2009 was used for entire water year. It is well defined to about 3500 cfs. Eleven discharge measurements (Nos. 430 to 440), ranging in discharge from 183 to 4490 cfs, were made during the water year. They cover the range in stage experienced, except lower flow days of Jan 30, 31; Feb 1-17, 23, 24, 27; Mar 12, 21, 25-28; Apr 3, 4, 6-8, 2010 and higher days of Jun 6, 7, 2010. The peak discharge of 4810 cfs occurred at 0745 June 6, 2010 at a gage height 6.97 ft with a shift = 0.10 ft. It exceeded maximum flow measurement No. 436, made June 8, 2010 by 0.25 ft. in stage.
Discharge.--	Shifting control method was used for the entire water year record. Shift distribution was made on a time basis for the period 0000 Oct 1 2009 to 1430 May 13, 2010, and from 1400 Aug 11 2010 to the end of the entire water year. Shifts were distributed by stage during runoff using two variable stage shift relationships: ARKSALCOVS10A, based on Msmts 434-436, applied from 1500 May 13 to the peak at 0745 Jun 6; and ARKSALCOVS10B, based on Msmts 436-439, applied from 0800 Jun 6 to 1315 Aug 11. Measurements indicated shifts varying from -0.07 to +0.10 ft. Due to the high water conditions this water year considerable scour and fill was seen through this water year. All shifts were given full weight and applied directly, except for measurement nos. 434, 439- 440, which were discounted -4% to +5% to smooth shift distribution.
Special Computations.--	Estimates of flow during ice affected periods were made based on good record prior to, during, and after such periods, measurements 431-432, and a hydrographic comparison to upstream and downstream gages: Arkansas River at Granite and Arkansas River near Wellsville, respectively.
Remarks.--	Record good, except for those periods of ice affected record, which are estimated and poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	Continue use of the ADCP to will prove its reliability at this site. Main issue with the usage of the ADCP at this site is the location of cable way to the control. At all levels there is an issue with the distance between the cable car and control, either the boat floats into the control boulders or when attempting to avoid the boulders the tag line becomes too short and lifts the ADCP sensor out of the water. This water year a weight will be hung from the A reel, then the boat can be held closer to the cable car also helping with the angle of the boat. Run levels and make more measurements in WY11.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07091500 ARKANSAS RIVER AT SALIDA

RATING TABLE-- ARKSALCO30 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	254	347	466	462	164	194	238	398	2860	1250	887	330
2	239	354	464	470	160	189	200	386	2510	1270	968	303
3	234	356	460	468	160	191	179	370	2230	1090	1090	284
4	236	351	458	462	177	192	180	341	2230	949	954	285
5	247	342	459	460	176	190	185	295	3390	809	823	277
6	265	339	467	470	174	191	172	277	4510	747	754	270
7	279	338	466	470	174	194	169	291	4590	679	680	275
8	340	334	462	454	179	215	173	258	4270	706	677	267
9	352	329	455	452	172	207	206	244	3670	687	714	276
10	351	334	450	452	160	211	247	272	3650	681	773	276
11	349	316	383	456	166	194	263	300	2940	675	748	263
12	339	316	319	456	168	182	298	305	2670	689	703	256
13	337	315	285	458	170	185	336	322	2700	595	720	258
14	357	321	227	458	172	193	312	317	2540	624	676	263
15	371	320	220	458	160	196	313	347	2430	639	679	264
16	372	278	250	458	180	193	378	453	2310	651	606	264
17	367	307	350	448	180	187	499	420	2140	653	567	266
18	364	410	410	449	194	194	414	391	2000	659	489	261
19	366	473	460	445	196	210	397	365	1900	654	392	239
20	373	474	476	397	200	184	408	364	1870	660	466	238
21	392	476	484	320	197	172	436	384	1990	685	478	239
22	366	475	479	269	192	189	519	489	1980	700	451	249
23	323	476	469	234	170	204	486	812	1880	693	431	268
24	307	464	468	228	168	202	387	1070	1810	651	427	282
25	305	463	457	221	190	182	336	1030	1720	664	403	279
26	308	464	451	208	188	180	318	1170	1750	656	374	277
27	313	466	464	208	178	178	309	1390	1700	638	360	271
28	353	466	466	194	189	172	309	2120	1640	661	349	249
29	326	464	471	187	---	183	383	2760	1640	675	351	250
30	314	466	468	178	---	206	406	3310	1400	777	351	268
31	332	---	467	164	---	245	---	3040	---	842	347	---
TOTAL	10031	11634	13131	11514	4954	6005	9456	24291	74920	23009	18688	8047
MEAN	324	388	424	371	177	194	315	784	2497	742	603	268
AC-FT	19900	23080	26050	22840	9830	11910	18760	48180	148600	45640	37070	15960
MAX	392	476	484	470	200	245	519	3310	4590	1270	1090	330
MIN	234	278	220	164	160	172	169	244	1400	595	347	238

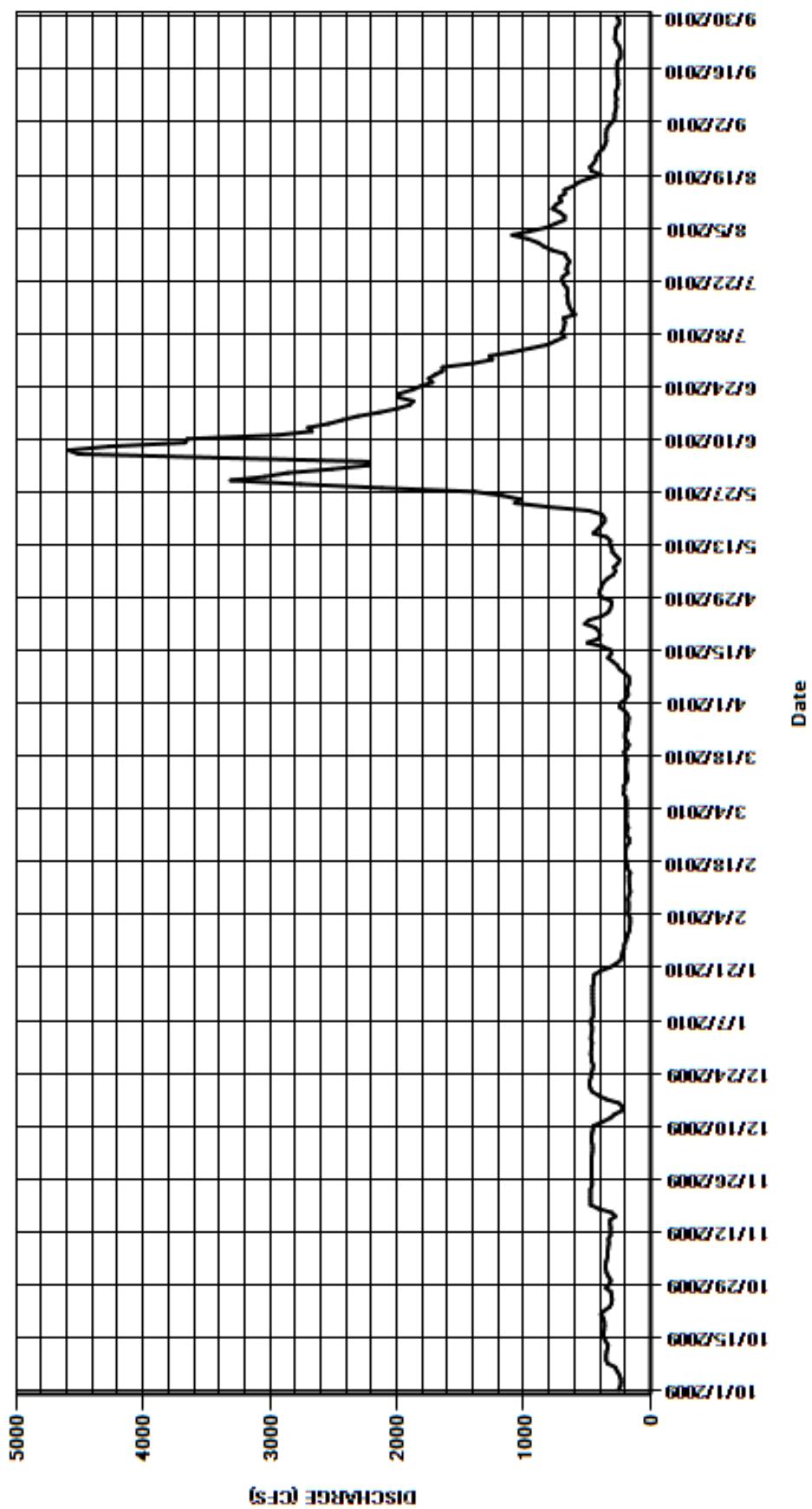
CAL YR	2009	TOTAL	259510	MEAN	711	MAX	3180	MIN	192	AC-FT	514700
WTR YR	2010	TOTAL	215680	MEAN	591	MAX	4590	MIN	160	AC-FT	427800

MAX DISCH: 4810 CFS AT 07:45 ON Jun. 06,2010 GH 6.97 FT. SHIFT 0.1 FT.

MAX GH: 6.97 FT. AT 07:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091500 ARKANSAS RIVER AT SALIDA
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07093700 ARKANSAS RIVER NEAR WELLSVILLE
Water Year 2010

Location.-- Lat. 38°30'10", Long. 105°56'21", in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T.49 N., R.9 E., Chaffee County, Hydrologic Unit 11020001, on right bank 50 ft upstream from Chaffee-Fremont County line, 2.0 mi northwest of Wellsville, 2.8 mi downstream from South Arkansas River, and 3.5 mi southeast of Salida.

Drainage and Period of Record.-- 1,485 mi². April 1961 to current year.

Equipment.-- Station is equipped with a satellite-monitored data collection platform (Sutron 8210 DCP) with a Sutron Constant Flow Bubbler (CFB). The CFB is set to an outside horizontal chain weight gage. Cableway located 400 feet downstream from gage. No changes.

Hydrologic Conditions.-- The Arkansas River nr. Wellsville is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural Drainage area is approximately 1485 sq miles with a mean elevation of 10200. The basin consists of high mountain terrain some of which is above tree line.

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite-monitored data with the DCP and CFB logs used as back-up. Record is complete and reliable, except for the following periods: Dec 5-16, 26, 27, 2009; Jan 28-31; Feb 1-18, 22-23, 2010 when gage height was affected by ice.

Datum Corrections.-- Levels were run Sept 12, 2007. No adjustments were needed/ taken.

Rating.-- Control is a rock riffle about 90 ft downstream. High water control is channel and rock banks. Rating No. 6A, dated Dec. 20, 1993 (extended on Dec. 30, 2002), was used this water year. It is well defined from about 170 to 5500 cfs. Twelve discharge measurements (Nos. 927-938) were made during the water year ranging in discharge from 244 to 5200 cfs. They cover the range in flows experienced except for the lower daily flow of Jan 30, 31; Feb 1-17, 2010. The peak flow of 5470 cfs occurred at 0615 June 7, 2010 at a gage height of 7.67 ft with a shift of +0.32 ft. It exceeded mean gage-height of measurement No. 933, made June 8, 2010 by 0.15 ft. in stage.

Discharge.-- Shifting control method used. All shifts were distributed and applied by time proportion. Measurements show shifts varying from -0.06 to +0.35 ft. All were given full weight and applied directly. Changing stream conditions throughout the year included heavy moss and channel scour/fill. The high measurement for the year had a high positive shift compared to historical shifts. However, it compares very well to the combined flows from upstream gages: ARKSALCO and SOAKTECO. Flows during the peak were unseasonably high and may have scoured the banks affecting the channel control and causing the higher shifts.

Special Computations.-- For comparison, the station Arkansas River at Salida, located 2.5 miles upstream, was plotted on the same hydrograph. Initially, the record for Arkansas River at Salida is worked, determining flows for ice-affected days there. Then, flows for missing/ ice affected/ suspect days at Arkansas River nr. Wellsville can be estimated from that data, as there is a reasonable correlation that exists between the two stations. There are no known withdrawals from the river between these two stations; only inflows, especially from the South Arkansas River. After preliminary shifting and daily flows are plotted for both, if the Salida plot line crosses over the Wellsville line (or vice-versa), then shifts are adjusted until there is at least some separation between the two, since there is always, on a daily basis, more flow at Wellsville than Salida.

Remarks.-- Record good, except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- The current cableway that is used for high water measurements is needing attention. Alternative measurement sections this water year were explored including the sale barn bridge located approximately 4 miles above gage. It is planned to replace the cable in water year 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07093700 ARKANSAS RIVER NEAR WELLSVILLE

RATING TABLE--

ARKWELCO06A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

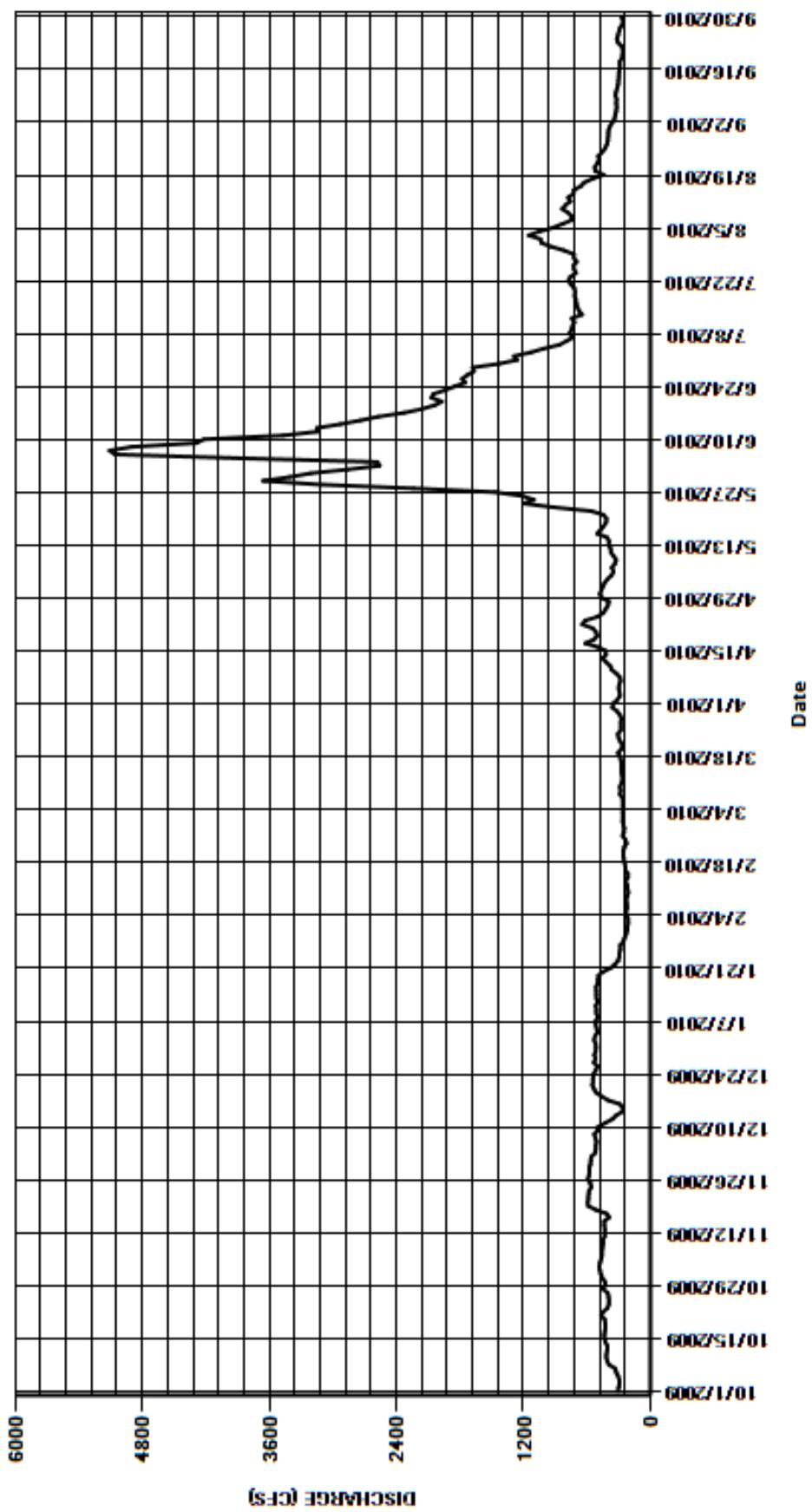
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	309	470	564	518	218	264	353	466	3210	1260	1030	380
2	300	478	560	533	211	260	314	450	2860	1290	1040	358
3	293	484	524	524	211	262	289	434	2560	1130	1150	339
4	295	477	517	501	228	262	292	405	2580	1010	1050	332
5	306	466	518	509	231	260	300	367	3890	861	922	323
6	324	459	510	517	221	261	297	348	5060	794	832	319
7	334	458	520	516	224	264	284	365	5110	730	748	323
8	393	455	532	497	230	289	288	338	4900	766	744	319
9	410	447	498	511	221	281	323	324	4290	746	779	331
10	417	449	494	511	210	288	367	345	4220	737	835	325
11	415	433	425	517	217	273	380	374	3470	719	803	314
12	409	432	360	499	221	263	419	376	3150	743	757	305
13	408	432	324	510	236	268	453	394	3150	646	778	302
14	426	437	265	510	214	276	420	391	2930	676	727	300
15	435	437	260	512	214	277	425	409	2740	690	724	298
16	436	390	290	515	239	275	498	503	2570	702	658	291
17	430	416	401	496	239	279	616	472	2330	706	625	288
18	425	517	460	496	246	287	533	442	2160	718	546	291
19	428	589	513	493	252	307	504	419	2040	712	440	268
20	432	592	533	450	257	275	515	416	1970	720	520	264
21	468	587	549	377	255	262	547	443	2070	752	529	261
22	446	585	542	337	248	286	644	562	2050	775	504	270
23	406	582	543	304	226	302	617	913	1940	757	486	307
24	393	559	536	296	237	307	502	1200	1850	705	493	317
25	392	568	515	292	264	280	446	1100	1750	722	458	306
26	397	591	502	285	252	281	423	1210	1780	727	430	298
27	404	582	534	287	248	282	403	1470	1730	698	413	286
28	449	578	519	256	257	275	393	2240	1670	723	403	261
29	427	580	531	245	---	288	458	3120	1680	723	401	262
30	431	568	517	230	---	316	479	3660	1430	816	399	276
31	456	---	514	221	---	360	---	3410	---	939	395	---
TOTAL	12294	15098	14870	13265	6527	8710	12782	27366	83140	24693	20619	9114
MEAN	397	503	480	428	233	281	426	883	2771	797	665	304
AC-FT	24390	29950	29490	26310	12950	17280	25350	54280	164900	48980	40900	18080
MAX	468	592	564	533	264	360	644	3660	5110	1290	1150	380
MIN	293	390	260	221	210	260	284	324	1430	646	395	261
CAL YR	2009	TOTAL	292046	MEAN	800	MAX	3510	MIN	260	AC-FT	579300	
WTR YR	2010	TOTAL	248478	MEAN	681	MAX	5110	MIN	210	AC-FT	492900	

MAX DISCH: 5470 CFS AT 06:15 ON Jun. 07,2010 GH 7.67 FT. SHIFT 0.32 FT.

MAX GH: 7.67 FT. AT 06:15 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07093700 ARKANSAS RIVER NEAR WELLSVILLE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07095000 GRAPE CREEK NEAR WESTCLIFFE
Water Year 2010

Location.--	Lat. 38°11'10", Long. 105°29'02" (Westcliffe, Colorado quadrangle, 1:24000 scale) in NW¼, NW¼, Section 31, T21S, R72W, Custer County, Hydrologic Unit 11020001, on left bank 0.5 mi upstream from waterline of DeWeese Reservoir at elevation 7690 ft, 0.5 mile downstream from Swift Creek, and 3.6 mile NW of Westcliffe CO.
Drainage and Period of Record.--	320 square miles (furnished by Corps of Engineers)..
Equipment.--	Graphic water stage recorder, shaft encoder, and satellite monitored data collection platform (Sutron Model 8210 DCP with HDR GOES radio) in a 48-inch diameter metal pipe (CMP) shelter and well. Primary reference gage is an electric drop tape inside the well. No outside staff gage. The control is a compound, broad-crested weir located 17 ft. downstream from the gage. An air temperature sensor, installed in radiation shield, and a tipping bucket raingage are also installed at the gage and monitored by the DCP. No changes this water year.
Hydrologic Conditions.--	The gage is located on Grape Creek approximately 3000 ft upstream of the high water line of DeWeese Reservoir. Grape Creek is one of two major creeks draining the Wet Mountain Valley. The gage is located downstream of approximately 15,000 acres of grass hay and pasture fields in the south and central portions of the valley. The gage is at elevation 7690 ft MSL with a drainage area of 320 sq mi consisting of the high mountain valley and east slope of the Sangre de Cristo mountains which rise to elevations of 12,000 ft to over 14,000 ft. Snowpack and snowmelt runoff, and summer thunderstorms dictate the shape and volume of the annual streamflow hydrograph. Peak runoff often occurs in the spring (late March-late May) due to high elevation snowmelt or melt of very wet (and often deep) spring snows in the valley. As a result of irrigation diversions, streamflows at the gage can generally be low during late May to early August, but often flashy peaks during this period are experienced due to intense summer thunderstorms.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the graphic chart record and DCP log data used for backup purposes. Record is complete and reliable, except for the following periods: October 29-31, November 16-30, December 1-5, 2009, and March 20-21, 24-25, 2010, when the stage-discharge relationship was affected by ice on the control; December 6-31, 2009; January 1-31, February 1-28, March 1-17, 2010, when either the chart floats were frozen in ice in the well, or, the well was frozen, intakes were frozen, and the control/weir pool was frozen over, or both. Low battery condition caused the DCP to miss transmissions during Oct 21-23, Dec 8-11, 2009, and Feb 23-25, 2010. Missing values were replaced with values from the DCP data log file without loss of accuracy. Single 15-minute values of 0.00 ft gage height were recorded on June 10 and Sept 1, 2010, and were replaced with backup chart record data without loss of accuracy.
Datum Corrections.--	Levels were run August 10, 2010 to the electric tape index using RM No. 1 as base. No corrections were necessary as the electric tape index elevation was found to be within allowable tolerances.
Rating.--	The control is a compound, broad-crested weir located 17 feet downstream from the gage. The PZF on the weir is gage height of approximately 0.30 ft. There is an approximately 6-foot wide section where the concrete has broken out on the downstream edge of the weir near the center. At high stages (greater than 3.00 ft gage height), the flow will go overbank on the right side of the weir, and the control includes grass-lined banks and secondary channel on right bank. Rating No. 9, in use since October 6, 2005, was continued in use for all of WY2010. It is well-defined to flows of about 525 cfs, 150% of the historical highest discharge measurement made in WY2007. Eighteen discharge measurements (Nos. 255-270, including two Flow Tracker measurements made back to back with conventional current meter measurements) were made during the year, ranging in discharge from 4.67 to 157 cfs. They cover the range in stage experienced except the lower daily flows of Sept 6, 7, 20, 2010; and the higher daily flows of March 30-31, April 1, 25, and June 7, 2010. The peak flow is estimated at 860 cfs (due to flow bypassing the gage on the right side of the channel; see separate documentation of the peak) and occurred at 2015 on March 31, 2010 at a gage height of 3.48 ft with a shift of 0.00 ft. It exceeded the stage of high flow measurement No. 265, made June 9, 2010, by 1.88 feet.
Discharge.--	Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the weir section for all periods of good record, except during the period 1745 Mar 31 to 0200 Apr 1, when stage exceeded 3.00 ft. Shifts were applied as defined by measurements and were distributed by time, with consideration of stage change, for the entire water year. Open water measurements showed raw shifts varying between -0.02 ft and 0.00 ft. All open water measurements were given full weight. Msmts. 264A and 266A, made with a FlowTracker immediately after making conventional current meter measurements, were discounted 5% and 8%, respectively, to match shifts obtained by the conventional current meter measurements (as the Flow Tracker measurements were considered test measurements using the new equipment).
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of 2 measurements (Nos. 258-259), and air temperature data collected at the gage. A hydrograph was used.
Remarks.--	Record good, except for periods of ice effect and no gage height record, which are poor. The peak gage height is considered good, however, due to flow bypassing the gage and rated weir section, the peak flow for the water year and flows during the period 1745 Mar 31 to 0200 Apr 1, 2010 are estimated and poor. Due to this, mean daily flows for March 31 and April 1 are considered estimated and poor. Station maintained and record developed by Thomas W. Ley

Recommendations.--

The concrete weir continues to degrade, experiencing spall damage due to ice. The peak runoff event on Mar 31 caused additional damage on the right edge of the weir, where a small section of concrete was broken out. A weir refurbishment project should be planned and implemented. As well, as the measurement point for DeWeese Reservoir inflows, a bank operated cableway should be installed for improved high flow measurement capability.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07095000 GRAPE CREEK NEAR WESTCLIFFE

RATING TABLE--

GRAWESCO09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

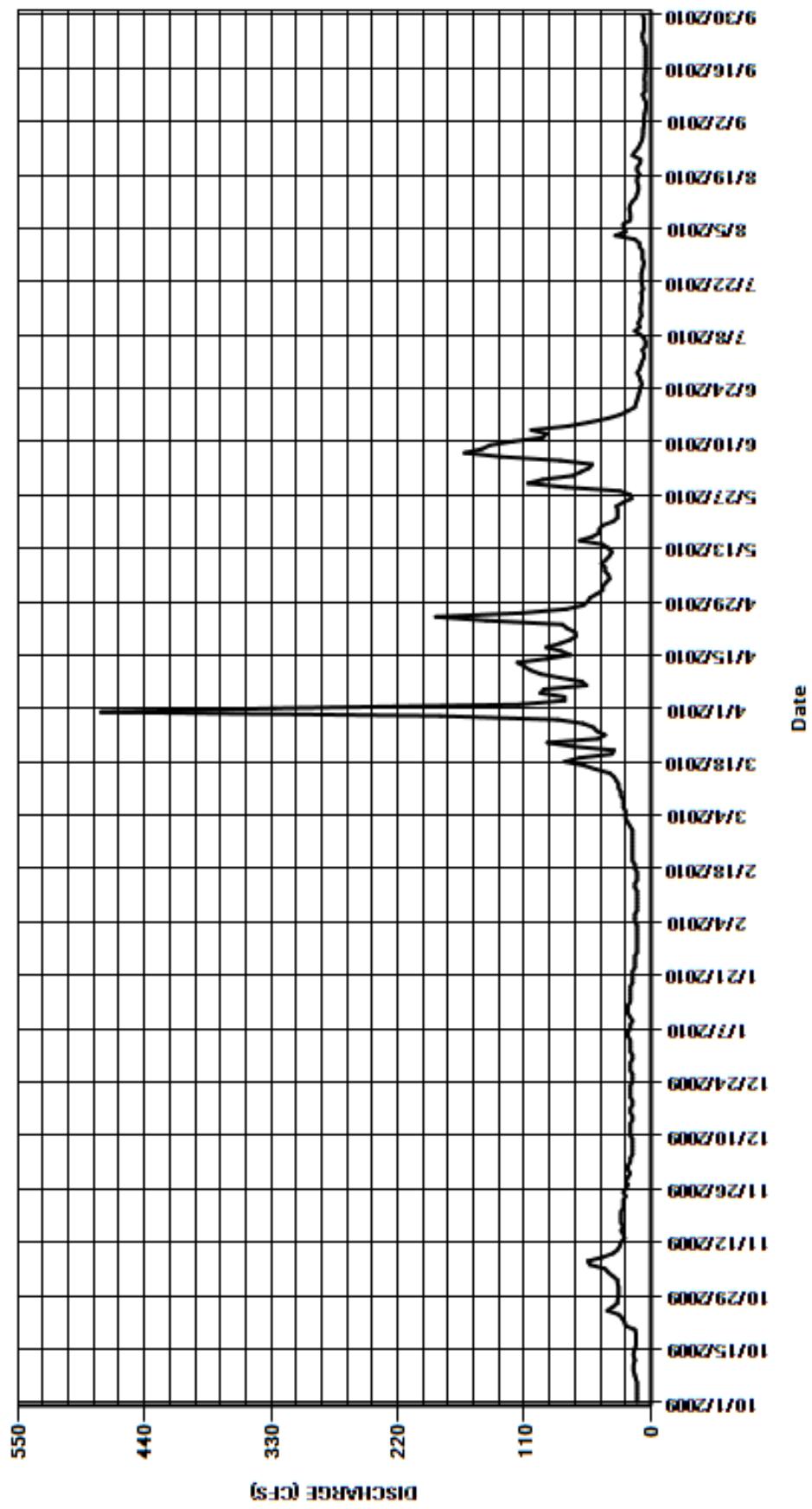
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	29	20	18	12	18	327	47	68	7.8	10	6.1
2	12	29	20	18	12	20	115	42	61	6	14	6.2
3	12	33	18	18	12	22	75	42	54	6.2	31	5.9
4	12	37	18	18	14	22	75	39	51	7.5	22	5.5
5	12	40	16	20	14	22	96	36	79	4.8	24	4.7
6	12	53	16	20	14	24	93	37	131	4.7	24	4.3
7	13	55	16	18	12	24	56	40	162	5.7	18	4.5
8	14	42	16	18	12	24	60	40	147	9.1	18	6
9	15	33	16	16	12	26	79	43	140	14	18	7.2
10	15	29	18	18	12	26	96	39	120	9.6	19	5
11	15	27	18	20	12	28	105	36	94	11	18	5.5
12	14	26	18	20	12	28	110	34	91	9.6	16	5.1
13	15	23	18	20	14	30	116	37	104	8.2	13	5.6
14	15	24	16	18	14	32	90	42	72	8.9	12	5.4
15	14	26	16	18	12	36	70	62	54	9.1	11	4.9
16	13	24	18	18	12	48	78	51	38	8.7	11	4.9
17	13	26	18	18	12	58	91	45	27	7.8	12	4.9
18	13	26	16	18	14	75	79	45	20	7.7	12	4.9
19	13	26	16	16	14	62	70	42	14	8.5	9.9	4.8
20	14	26	18	16	16	34	65	33	13	6.9	12	4.6
21	22	24	18	16	16	32	66	29	12	7.6	12	4.8
22	23	24	18	16	16	68	73	29	11	8.4	9.4	5.2
23	25	24	18	14	16	90	77	29	10	8.5	9.2	6.9
24	28	22	16	14	16	46	143	30	9.4	8.4	16	7.4
25	38	24	16	14	16	40	187	24	7.9	7.5	14	7.2
26	33	22	16	14	16	47	112	17	9.1	6.7	11	6.2
27	29	20	18	12	16	50	74	18	10	6.2	9.4	6.2
28	29	22	18	12	16	59	59	27	12	7.4	7.8	6.4
29	28	20	18	12	---	81	55	74	9.9	7.3	7.2	6.2
30	28	18	16	12	---	183	53	107	8.7	7.3	6.8	7.3
31	28	---	16	12	---	478	---	94	---	10	6.8	---
TOTAL	579	854	534	512	386	1833	2845	1310	1640.0	247.1	434.5	169.8
MEAN	18.7	28.5	17.2	16.5	13.8	59.1	94.8	42.3	54.7	7.97	14	5.66
AC-FT	1150	1690	1060	1020	766	3640	5640	2600	3250	490	862	337
MAX	38	55	20	20	16	478	327	107	162	14	31	7.4
MIN	12	18	16	12	12	18	53	17	7.9	4.7	6.8	4.3
CAL YR	2009	TOTAL	14233.9	MEAN	39	MAX	334	MIN	5.6	AC-FT	28230	
WTR YR	2010	TOTAL	11344.4	MEAN	31.1	MAX	478	MIN	4.3	AC-FT	22500	

MAX DISCH: 860 CFS AT 20:15 ON Mar. 31,2010 GH 3.48 FT. SHIFT 0 FT. (estimated)

MAX GH: 3.48 FT. AT 20:15 ON Mar. 31,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07095000 GRAPE CREEK NEAR WESTCLIFFE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07096000 ARKANSAS RIVER AT CAÑON CITY
Water Year 2010

Location.--	Lat. $38^{\circ}26'02''$, Long. $105^{\circ}15'24''$, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, T.18 S., R.70 W., Fremont County, Hydrologic Unit 11020002, on right bank 800 ft upstream from Sand Creek, 0.7 mi downstream from Grape Creek, and 0.7 mi upstream from First Street Bridge in Canon City.
Drainage and Period of Record.--	3,117 mi 2 . January 1888 to current year. Monthly data only for some periods. Published as near Canyon 1900-1906.
Equipment.--	Shaft encoder and Sutron stage discharge recorder (SDR) on separate floats connected to a Satlink 2 data collection platform in a 4-ft x 4-ft steel outhouse-type shelter over a 42-inch CMP stilling well. Primary reference gage is electric drop tape inside the shelter and well. Water temperature and specific conductance is monitored by the USGS and logged – transmitted with the Satlink 2. Equipment modifications for this water year include: a static tube was installed on upstream intake on March 10, 2010 ; the Sutron 8210 DCP and antenna were replaced with the same on March 25, 2010 ; the Sutron 8210 DCP was replaced with a Sutron Satlink2 on July 14, 2010 . No other changes.
Hydrologic Conditions.--	The drainage basin above the gage encompasses approximately 3,060 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 5,361 ft with vegetation ranging from alpine tundra to sparse pinon-juniper. Upstream from the gage, the Arkansas River is characterized by steep gradient, high velocity flows that are confined to a relatively narrow rock and cobble stream channel. The gage is located downstream of the Royal Gorge bridge 3.10± miles and is 0.7± miles downstream of Grape Creek inflows. Streamflow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from snowmelt runoff with high intensity – short duration summer thunderstorms contributing in the minor. Mean annual precipitation for the basin is 18.02± inches. Flow varies seasonally due mainly to snowmelt in the Sawatch Range. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise flows are affected by regulation of upstream reservoirs. Upstream diversions, Hydraulic and South Canon ditches, affect flows and often cause flows at the gage to be lower than those at the upstream Parkdale gage. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored shaft encoder data, with DCP log and a SDR log as backup. Record is complete and reliable, except for the following periods: Dec. 5, 8-20, 22-31, 2009; Jan. 1-16, 25-29, 2010; Feb 6-17, 2010: Gage height data affected by ice on the control structure. During cold periods (typically overnight lows less than 10° F), ice has been observed to form on the 2nd stage weir and surrounding boulders and creates ice-affected backwater conditions at the gage. Short periods of missing data on October 25-26, 2009, March 14, 23, 24, 25, 2010 due to antenna problems were filled in from DCP log without loss of accuracy. Primary and backup stage sensor calibration to reference gage is supported by 20 visits made this water year. Based on these visits, the following corrections were applied to the gage height record: November 23 – December 11, 2009: prorated from 0.00 to -0.02 ft correction.
Datum Corrections.--	Level surveys were completed three times during the water year using the Topcon RL-H3A rotary head laser combined with either the Nedo ETR or Crain Telescoping rod. Previous issues in WY 2009 with water surface elevations differences inside the well and outside on the river ranging from 0.05 ft to 0.09 ft appear to have been resolved. Survey results are as follows. August 12, 2010: This was the first use of the rotary head laser level technology. Levels run from RM 10 and closed with -0.001 ft error. Electric tape RP found 16.775 ft vs. the published value of 16.783 ft. Outside water surface was 0.015 ft higher than inside the stilling well. No correction made due to equipment learning curve. August 13, 2010: Levels run from RM 10 and closed with +0.001 ft error. Electric tape reference point found at 16.781 ft vs. the published value of 16.783 ft. Outside water surface was 0.006 ft higher just upstream of the intakes and 0.006 ft lower just downstream of the intakes. No corrections were made as the water surface was not smooth. August 30, 2010: Levels run from RM 10 and closed with -0.001 ft error. Electric tape RP found at 16.775 ft vs. the published value of 16.783 ft. Outside water surface was 0.041 ft higher 10 ft upstream of the intakes. No corrections were made as the water surface was not smooth.
Rating.--	Control is a 2-stage diversion dam for the Canon City Water Works pump station (diversion structure #503) located ~250 ft downstream of the gage. The 1st stage consists of a grouted riprap whitewater bypass chute, approximately 13 ft wide, with sloped sides, and a concrete sill with a point of zero flow at approximately 3.65 ft, gage datum, according to construction plans. Flow through the chute appears to go through critical depth at most stages but could be subject to submergence due to downstream obstructions. The whitewater bypass was cut into the original ogee weir around 1993. The 2nd stage control consists of an ogee weir, ~65 ft wide and with a crest elevation of ~4.9 ft, gage datum. Boulders were grouted to the downstream face of the weir during the 1993 work. The weir and whitewater bypass have vertical abutments up to a gage height around 12 feet above which the channel banks would become part of the control. Around 14-ft flows would spill into floodplains. Rating No. 23, in use since October 1, 2002, was used all water year. The rating is well-defined by historical measurements to 7000 cfs. Rating No. 23 remains applicable given that the percent error between measured values and the un-shifted rating curve averages 6.71% for measurements this water year and 6.83% when the high and low gage height measurements are discarded from the data set. Twenty discharge measurements (Nos. 722-741) were made this water year, ranging in discharge and stage from 171 cfs (5.04 ft) to 4320 cfs (9.24 ft). WY2010 measurements covered the range in stage experienced except for the lower daily flows of September 29-30, 2010 and the higher daily flows of June 6-8, 2010. The peak instantaneous flow of 5210 cfs occurred at 16:30 on June 7, 2010 at a gage height of 9.8 ft with a shift of +0.14 ft. It exceeded the stage of measurement No. 735, made June 9, 2010, by 0.56 feet.

Discharge.--

Shifting control method was used to compute discharge for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were prorated by time from the beginning of the water year to the start of the ascending limb of the peak runoff on March 31, 2010 at 06:45 hrs. Two variable shift curves were used to define the peak event: SC10A was applied to the ascending limb (March 31, 2010 at 07:00 hrs to June 7, 2010 at 18:00 hrs encompassing measurement numbers 732-735) and SC10B was applied to the descending limb of the peak (June 7, 2010 at 19:00 hrs to September 7, 2010 at 13:00 hrs encompassing measurement numbers 735-740). The peak started at 16:30 on June 7, 2010 and occurred equally several times until 18:00 hrs. Shifts were again prorated from the end of the descending limb on September 7 at 14:00 hrs to the end of the water year. Measurement numbers 722-725, 727-731, 733-734 and 736 were all discounted between 4% and -3% for smoothing purpose in the shifting control methodology. Measurement number 724 was not used in the shift analysis due to ice affect.

Special Computations.--

Ice-affected periods of December 5, 8-20, 22-31, 2009; January 1-16, 25-29, 2010; February 6-17, 2010 were determined with NOAA air temperature data from the Canon City temperature gage approximately 2.5 miles away from the gage and water temperature at the gage. Upstream and downstream hydrographs at Wellsville, Grape Creek and Portland were used to validate daily average flows.

Remarks.--

Record is good, except for periods of ice effect which are estimated and poor. Station maintained and record developed by Charles DiDomenico.

Recommendations.--

An outside staff gage is recommended to validate stilling well levels. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. The whitewater bypass section of the control should be surveyed during any low flow events (less than 200 cfs) to confirm the point of zero flow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07096000 ARKANSAS RIVER AT CAÑON CITY

RATING TABLE--

ARKCANCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

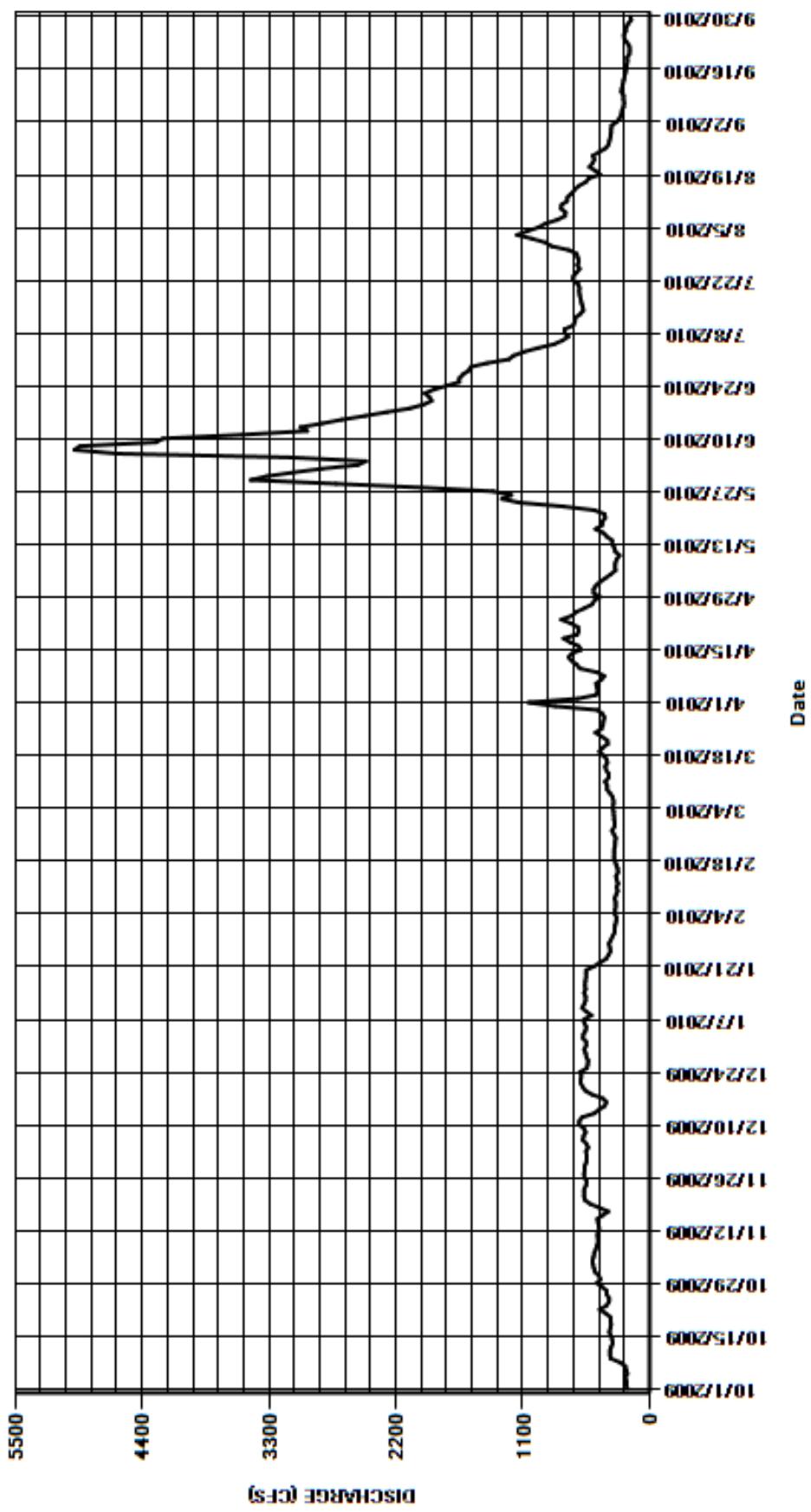
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	195	475	547	550	300	310	1050	486	3090	1220	905	331
2	201	484	548	580	290	311	625	467	2840	1180	1020	286
3	200	492	552	574	288	313	465	430	2530	1090	1150	259
4	212	497	534	556	304	319	448	382	2460	967	1060	245
5	194	486	550	550	300	315	457	337	3120	830	963	240
6	205	481	581	568	295	314	465	297	4620	758	903	226
7	211	467	573	568	295	323	421	300	4990	706	802	222
8	258	456	556	504	304	347	394	298	4940	739	734	228
9	338	447	570	550	291	371	458	285	4280	738	730	227
10	344	450	610	586	278	369	605	261	4220	663	770	247
11	345	452	610	568	287	386	631	298	3530	648	764	240
12	335	439	586	556	274	358	675	307	2970	647	716	232
13	322	440	482	556	287	354	703	325	3030	603	713	226
14	325	447	440	568	291	377	675	326	2840	575	677	218
15	336	454	390	556	274	386	595	372	2670	581	650	211
16	350	408	375	562	278	367	617	404	2470	592	615	204
17	342	359	405	558	291	374	692	469	2280	598	555	199
18	335	436	498	553	301	405	747	413	2080	607	527	193
19	339	515	556	552	311	437	629	409	1960	611	430	196
20	341	561	580	551	308	408	615	385	1890	609	469	176
21	382	569	597	483	308	363	622	393	1910	622	522	173
22	434	568	598	432	301	368	685	480	1950	665	496	176
23	377	568	592	379	301	419	767	752	1870	662	479	196
24	354	550	604	358	293	472	675	1130	1760	635	494	220
25	352	547	544	340	310	418	636	1280	1650	607	436	224
26	373	566	538	345	327	406	566	1200	1650	628	382	209
27	373	569	533	355	307	402	500	1360	1620	613	356	204
28	413	564	550	336	303	392	481	1980	1570	625	349	188
29	458	565	556	322	---	410	431	2720	1550	633	341	161
30	426	550	568	304	---	453	486	3460	1410	704	336	167
31	441	---	550	304	---	818	---	3320	---	851	334	---
TOTAL	10111	14862	16773	15124	8297	12065	17816	25326	79750	22207	19678	6524
MEAN	326	495	541	488	296	389	594	817	2658	716	635	217
AC-FT	20060	29480	33270	30000	16460	23930	35340	50230	158200	44050	39030	12940
MAX	458	569	610	586	327	818	1050	3460	4990	1220	1150	331
MIN	194	359	375	304	274	310	394	261	1410	575	334	161
CAL YR	2009	TOTAL	291025	MEAN	797	MAX	3440	MIN	144	AC-FT	577200	
WTR YR	2010	TOTAL	248533	MEAN	681	MAX	4990	MIN	161	AC-FT	493000	

MAX DISCH: 5210 CFS AT 16:30 ON Jun. 07,2010 GH 9.8 FT. SHIFT 0.14 FT.

MAX GH: 9.8 FT. AT 16:30 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07096000 ARKANSAS RIVER AT CANON CITY
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07097000 ARKANSAS RIVER AT PORTLAND
Water Year 2010

Location.--	Lat. 38°23'18", Long. 105°00'56", in NE¼NE¼ sec. 20, T.19 S., R.68 W., Fremont County, Hydrologic Unit 11020002, on right bank at bridge on State Highway 120 at Portland and 1 mi downstream from Hardscrabble Creek.
Drainage and Period of Record.--	4,024 mi ² .
Equipment.--	Graphic water-stage recorder and a float controlled Sutron Shaft Encoder inside a 36-inch CMP stilling well and shelter along with a tipping bucket rain gage is logged and transmitted with a Satlink 2 Data Collection Platform which is housed in a 4-ft x 4-ft steel shelter on the upper right bank. Primary reference gage is drop tape referenced to an adjustable RP on the shelf inside the CMP shelter and well. A Sutron Continuous Flow Bubbler housed in the upper shelter monitors water level approximately 102 feet upstream of the stilling well and its companion staff gage is set in the river adjacent to the CFB end cap. Water temperature and specific conductance is monitored by the USGS and logged – transmitted with the Satlink 2. A cablecar is suspended from a monorail attached to upstream side of Highway 120 Bridge 10-15 feet downstream from gage. Equipment modifications for this water year include: Sutron 8210 DCP replaced with a Sutron Satlink2 on July 14, 2010; CFB orifice line relocated 102 ft upstream of intakes on September 15, 2010; Channel staff gage installed adjacent to CFB end cap on September 15, 2010. No other changes.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 3,950 square miles. Flow varies seasonally due mainly to snowmelt. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise, flows are highly affected by regulation of upstream reservoirs. Upstream operations from the Minnequa Canal also affect flows at the gage. No hydrologic conditions changes in the basin observed this water year. Channel bed consists of material from coarse sand to large cobble. The left bank above the gage is a steep (almost vertical bank) composed mostly of shale material and vegetation. The right bank consists of a more gradual slope to an elevation of 5 – 6 feet then a "shelf" going into another sloped side all of which is covered with vegetation. The river width is limited to approximately 120 feet by a railroad bridge with concrete abutments about 100 feet upstream of the gage and similarly limited by Highway 120 Bridge immediately below the gage.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored shaft encoder data with DCP log and a graphic water-stage recorder backup. Record is complete and reliable. Missing unit values and/or suspect data were replaced with backup data with no loss of accuracy on the following dates: October 21, November 14, 17-19, 2009, June 13, 14, 15, June 18-21, July 11-14, 2010. Primary and backup stage sensor calibration to reference gage is supported by 22 visits made this water year. Based on these visits, the following gage height corrections were applied to the gage height record: June 6 – June 24, prorated from 0.00 to 0.04 ft correction; July 27 – August 10, prorated from 0.00 to -0.04 ft correction; August 10 – August 17, prorated from 0.00 to 0.03 ft correction.
Datum Corrections.--	Level surveys were completed five times during the water year using the Topcon RL-H3A rotary head laser combined with either the Nedo ETR or Crain Telescoping rod or the conventional auto level. Survey results are as follows. July 27, 2010: This was the first use of the rotary head laser level technology. Levels run from RM 6 and closed with -0.006 ft error. RP found 12.045 ft vs. the published value of 12.040 ft. No correction made due to equipment learning curve. August 10, 2010: Conventional auto level run from BM 5 and closed with 0.001 ft error. RP found at 12.038 ft average vs the published value of 12.040 ft. Tape length and water surface was checked and confirmed. August 10, 2010: Rotary head laser run from BM 5 and closed with 0.026 ft error. RP found at 12.039 ft average vs the published value of 12.040 ft. Crain Telescoping rod used. August 13, 2010: Rotary head laser run from BM 5 and closed with -0.003 ft error. Various bench marks checked. Nedo ETR used. August 30, 2010: Rotary head laser run from BM 5 and closed with no error. Various bench marks checked. Nedo ETR used.
Rating.--	The control at low flow is a downstream rock riffle that consists of gravel to large cobble in the stream channel. At medium to high flows, the riverbank and the highway bridge abutments are part of the control. Rating No.10 dated October 31, 2007 was used the entire water year. Twenty two discharge measurements (Nos. 968-989) were made this water year ranging in discharge from 214 to 5070 cfs. They cover the range in stage experienced, except for the lower mean daily flows on September 21-22, 2010. No mean daily flows exceeded the measured maximum value. The peak flow of 5280 cfs occurred at 1845 hrs on June 6, 2010 at a gage height of 7.13 ft with a shift of 0.14 ft. The peak exceeded the stage of high flow measurement no. 982 made June 7, 2010 by 0.16 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time from the beginning of the water year through March 17, 2010 at 1413 hrs based on Measurements 968-975; and again by time from August 17, 2010 at 1200 until the end of the water year based on Measurements 987-989. Two stage-shift relationships were developed and used during the runoff/peak flow period. Shift curve ARKPORCOSC1 was used from 1500 March 17, 2010 until the peak that occurred at 1845 June 6, 2010. It is based on Measurements 976-982. Shift curve ARKPORCOSC2 was used from 1900 June 6, 2010 until 1100 August 17, 2010. It is based on Measurements 982-986. Raw shifts varied from 0.00 ft to +0.18 ft. with all measurements made in open channel conditions. All measurements were given full weight and applied directly for record purposes with the exception of numbers 975-977, 979, 985 and 986, which were discounted -3% to +7% respectively to smooth shift distributions.
Special Computations.--	An overlay of water temperature and gage height combined with site visits did not show any ice effect this water year. The record is also affected by Minnequa Canal sluicing operations which occur upstream of the gage approximately 8.75 miles and at irregular intervals throughout the water year. This operation causes the gage height to increase then decrease rapidly over a short period of time before returning to pre-operation levels and is essentially smoothed in the record by the computation of the daily average of unit data. A hydrograph was used to compare the mean daily flows with upstream gage Arkansas River at Canon City. Minnequa Canal diversions were also examined for sluicing operations.

Remarks.--

The record and the peak discharge are considered good. Station maintained and record developed by Charlie DiDomenico.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07097000 ARKANSAS RIVER AT PORTLAND

RATING TABLE--

ARKPORCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	263	529	596	556	282	319	1070	579	3340	1250	964	360
2	270	539	593	573	264	313	673	567	3050	1170	1110	329
3	261	551	579	563	252	305	496	541	2650	1120	1360	296
4	278	533	542	556	276	309	466	497	2510	996	1250	275
5	265	535	543	552	278	307	469	456	3080	861	1120	261
6	289	536	573	565	264	303	484	412	4590	765	1050	247
7	302	525	569	557	279	312	469	411	5040	700	928	235
8	343	516	530	509	287	335	428	417	4950	740	831	238
9	445	510	508	547	280	373	460	399	4290	765	818	242
10	460	503	592	592	268	369	592	350	4070	683	857	244
11	464	501	584	570	268	388	659	383	3670	672	868	249
12	463	471	580	546	269	359	699	434	3110	664	820	244
13	454	470	506	535	271	345	734	442	3160	616	791	241
14	450	480	460	544	287	367	733	471	3000	561	751	240
15	445	522	372	529	266	409	598	505	2770	576	716	232
16	448	479	341	535	256	377	609	507	2510	589	845	224
17	438	417	360	541	283	364	719	572	2300	593	633	224
18	424	466	441	534	290	392	820	517	2120	606	582	221
19	413	574	489	537	303	410	677	519	1980	608	482	217
20	419	627	547	538	304	404	638	508	1910	616	440	214
21	491	623	574	466	313	343	626	510	1900	665	478	205
22	538	622	588	405	298	334	681	541	1940	707	470	202
23	465	618	576	351	277	399	841	784	1870	713	445	216
24	417	607	579	308	279	489	760	1170	1790	686	517	235
25	426	593	540	277	312	434	686	1330	1690	641	465	254
26	457	617	555	277	344	400	642	1210	1660	668	427	259
27	443	630	540	298	316	390	580	1370	1660	650	418	255
28	474	620	573	305	307	377	547	1970	1590	672	403	247
29	541	621	572	303	---	389	524	2820	1560	663	385	232
30	485	609	561	280	---	447	582	3620	1460	727	363	218
31	492	---	547	277	---	746	---	3600	---	910	350	---
TOTAL	12823	16444	16510	14526	7973	11808	18962	28412	81220	22853	21937	7356
MEAN	414	548	533	469	285	381	632	917	2707	737	708	245
AC-FT	25430	32620	32750	28810	15810	23420	37610	56360	161100	45330	43510	14590
MAX	541	630	596	592	344	746	1070	3620	5040	1250	1360	360
MIN	261	417	341	277	252	303	428	350	1460	561	350	202

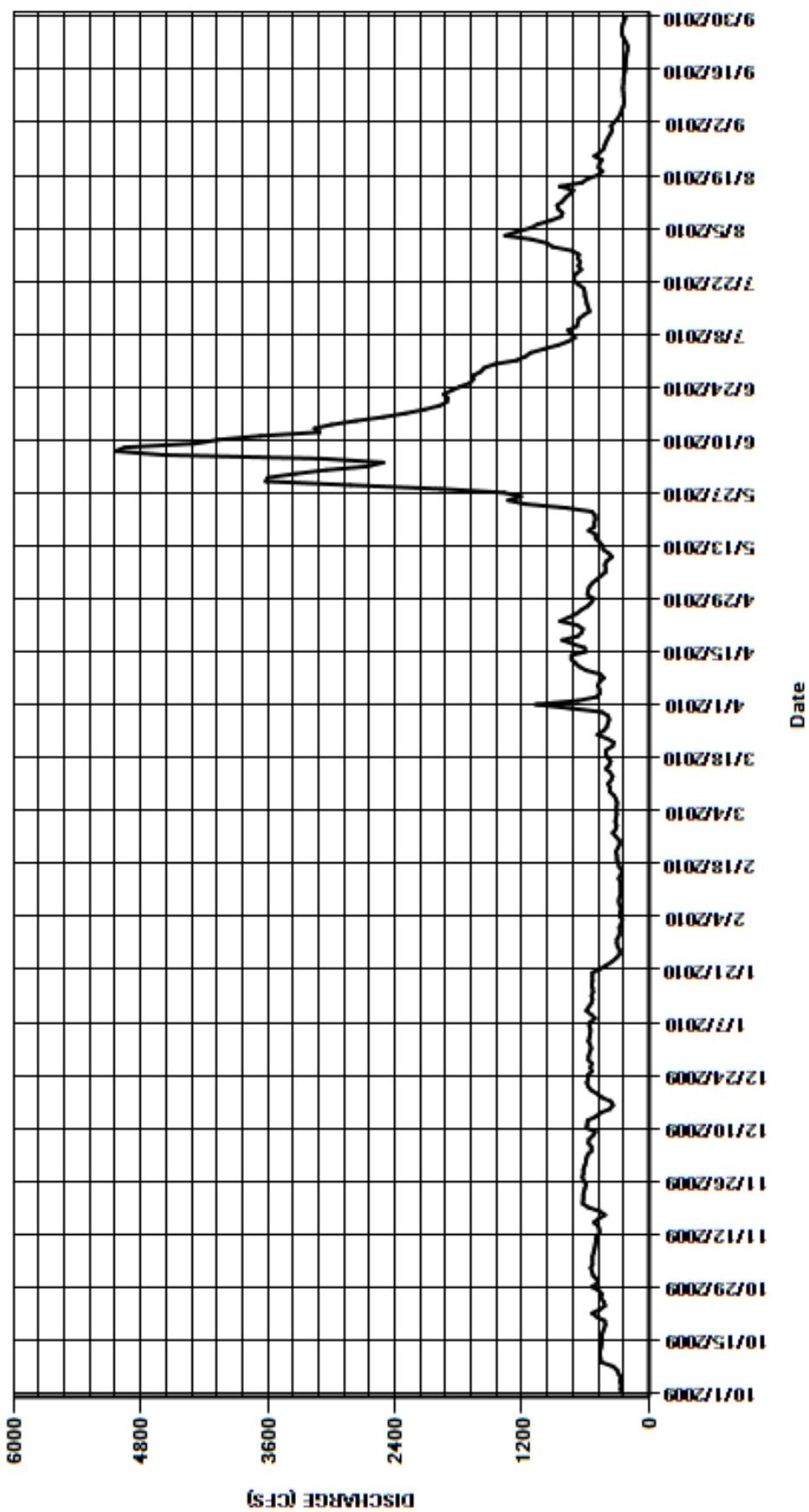
CAL YR	2009	TOTAL	301775	MEAN	827	MAX	3620	MIN	184	AC-FT	598600
WTR YR	2010	TOTAL	260824	MEAN	715	MAX	5040	MIN	202	AC-FT	517300

MAX DISCH: 5280 CFS AT 18:45 ON Jun. 06,2010 GH 7.13 FT. SHIFT 0.14 FT.

MAX GH: 7.13 FT. AT 18:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07097000 ARKANSAS RIVER AT PORTLAND
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07099400 ARKANSAS RIVER ABOVE PUEBLO
Water Year 2010

Location.--	Lat. 38°16'18", Long. 104°43'03", in SE 1/4 NE 1/4 sec. 36, T.20 S., R.66 W., Pueblo County, Hydrologic Unit 11020002, on left bank of Arkansas River, 100' downstream from NE corner of Arkansas River bridge, approx. 0.25 mi. downstream from Pueblo Dam, and 7 mi. West of Pueblo.
Drainage and Period of Record.--	4,670 mi ² . October 1965 to current year. Periodic water quality and sediment data available Oct. 1965 to current year.
Equipment.--	Satellite-monitored data collection platform (high data rate Sutron 8210 DCP) with a Sutron Constant Flow Bubbler (CFB) and shaft encoder; and an A-35 graphic chart recorder in a 4 ft x 4 ft concrete block shelter over a CMP stilling well. During periods of low flow (typically gage heights less than 2.50 ft), the primary reference gage is a staff gage on the left bank just below the shelter, in line with the well intakes. When the well has good contact to the river (gage heights greater than 1.80 ft), an electric drop tape referenced to a fixed index mounted on the instrument shelf inside the shelter is also used. It is the primary reference gage above gage heights of 2.69 ft, when the outside staff becomes submerged. A cableway located approximately 10 feet upstream from gage is used for high flow measurement. USGS Hydrolab measuring water temperature and specific conductance is co-located at the gage and monitored by the DCP. No equipment changes made this water year.
Hydrologic Conditions.--	The gage is located approximately a quarter mile downstream of the Pueblo Reservoir Dam at an elevation of 4740 ft above MSL. Streamflow is directly affected by regulation of the reservoir gates. The riverbed mainly consists of gravel and cobble to large rocks 24+ inches. The riverbed is continuing to stabilize after channel work and rock jetty placement done December 2004 – May 2005. The channel is subject to moss growth from October to May of various types, due to the cold and low flows. Discharge measurements in the range from ~650 to 800 cfs are of poor quality as the gage height is too deep to wade and to shallow for a good cable measurement.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data. For the periods: October 1, 2009 to March 10, 2010 and from September 21 to September 30, 2010, when gage heights were less than 2.50 ft, the CFB was used for primary record with the CFB log as backup. For the period: March 10 to September 21, 2010, when gage heights were over 2.50 ft, the shaft encoder was used for primary record, with the graphic chart recorder used for backup purposes. The CFB is not used during high water, due to a problem with it tracking accurately at high stages. The record is complete and reliable for entire water year, except the period from October to mid May when moss growth in the channel, can cause a backwater effect. This gage is immediately below the Pueblo Reservoir and does not experience ice effects.
Datum Corrections.--	Levels were run August 16 and September 3, 2010. A Topcon RL-H3A rotating head laser level with a Crain Model #90343 telescoping rod or a Nedo ETR. The September 3 levels were run to the electric tape index using BM10 as base. The ET index elevation was found to be within allowable limits, so no corrections were taken or necessary. Levels were last run to the outside staff gage in Sept 2008. At that time, the staff was found to be 0.03 ft high. The staff elevation has not been corrected and this datum error has been absorbed in the shifts during lower flow periods when the outside staff is the primary reference for the CFB.
Rating.--	The control at low flow is a series of rock riffles and large rocks below the gage. The large rocks (36 inch plus) were placed in clusters, starting at ~100 feet below the gage house at various points crossing the river, while the "riffles" which start ~150 feet below the gage house consist of 24 to 36 inch rock placed in a series of jetties extending from the left bank angling upstream at lengths from 30% to 50 % across the river. The control at medium and high flows is the riverbed (gravel to large cobble) along with the large rock placements and banks (grass and brush). Negative shifts continue to be observed at gage-heights less than 2.50 ft this water year. Moss growth in the channel also contributes to the negative shifts at low flows. Moss was not noted as often this water year as in past years. Rating No. 18 was used this entire water year and is well defined to 6000 cfs. Twenty-two discharge measurements (Nos. 1170 – 1191) were made this water year, ranging in discharge from 61.0 to 4920 cfs. They cover the range in stage experienced, except for the higher daily flows of June 8, 2010. The peak discharge of 5250 cfs occurred at 0915 June 8, 2010 at a gage height of 7.70 ft with a shift of 0.03 ft. It exceeded measurement No.1181 made June 7, 2010 by 0.35 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and prorated by time for the periods: 0000 October 1 to 1532 October 5, 2009 and from 1300 September 27 2010 to the end of the water year. Two variable shift curves were developed and applied to account for shift changes that occurred through the year as determined by numerous discharge measurements after many reservoir release gate changes. Variable shift curve SC10A (based on measurements Nos.1170-1181) was applied from 1600 October 5, 2009 to 0830 June 9, 2010. Variable shift curve SC10B (based on measurements Nos. 1182-1191) was applied from 0900 June 9, 2010 to 1200 September 27, 2010. Raw shifts varied from -0.10 to +0.11 ft., with all measurements made in open channel conditions. All measurements were given full weight with the exception of Nos. 1170-1175, 1177-1180, 1182, 1184-1185, and 1190-1191, which were discounted from -3 to +8 percent for smoothing purposes.
Special Computations.--	A hydrograph was developed and analyzed to validate daily average flows.
Remarks.--	The record is rated good, except for periods of moss, which should be considered fair. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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07099400 ARKANSAS RIVER ABOVE PUEBLO

RATING TABLE-- ARKPUECO18 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

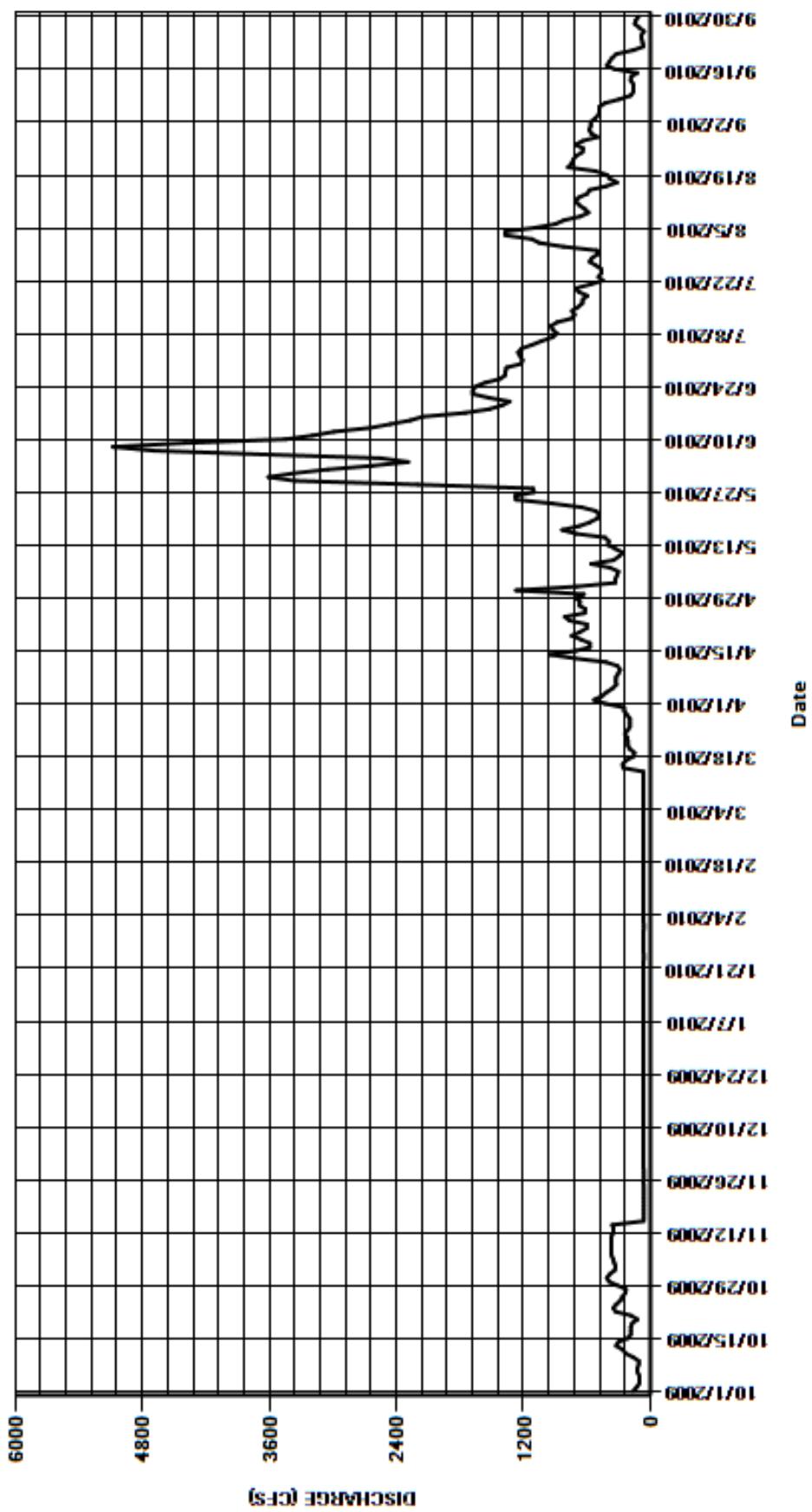
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	164	384	65	67	64	66	427	1270	3370	1210	1050	564
2	131	338	66	68	65	66	534	696	3050	1230	1120	564
3	106	329	66	68	65	66	458	332	2630	1250	1370	522
4	104	343	66	68	65	66	416	332	2290	1220	1370	487
5	105	354	66	67	65	65	361	316	2550	1120	1090	483
6	121	368	66	67	65	66	324	303	3660	1030	897	483
7	124	368	67	67	65	66	326	383	4700	926	818	431
8	112	369	67	67	65	66	326	562	5080	884	663	296
9	111	368	66	67	65	66	304	348	4400	923	586	187
10	166	369	66	67	69	66	286	298	3450	940	622	162
11	235	368	66	68	65	66	312	261	3190	882	673	162
12	263	349	66	68	65	66	420	331	2990	744	710	162
13	325	349	66	67	65	66	715	401	2650	716	679	188
14	303	360	65	67	65	66	948	393	2460	742	598	184
15	214	65	66	67	65	258	704	428	2270	685	575	125
16	186	63	66	67	65	262	571	702	2150	644	419	340
17	187	63	66	67	67	230	571	834	1750	641	316	413
18	185	63	66	67	66	162	657	675	1520	596	384	386
19	172	63	66	67	66	152	744	575	1400	677	411	361
20	123	63	67	67	66	195	664	505	1330	707	520	322
21	183	64	67	67	66	215	600	482	1530	567	779	164
22	327	64	67	66	66	215	599	515	1680	450	744	65
23	352	64	67	65	66	218	765	653	1680	492	730	75
24	323	64	67	64	66	242	810	928	1650	465	704	83
25	283	65	67	65	66	214	621	1270	1560	464	644	86
26	265	65	67	65	66	193	613	1280	1420	514	635	61
27	236	64	67	65	66	194	673	1100	1370	575	709	106
28	233	64	67	65	66	194	665	1110	1370	552	641	149
29	314	65	67	65	---	221	704	2200	1360	499	502	137
30	392	65	67	65	---	247	630	3360	1220	505	561	110
31	412	---	67	65	---	250	---	3610	---	822	578	---
TOTAL	6757	6040	2058	2062	1836	4585	16748	26453	71730	23672	22098	7858
MEAN	218	201	66.4	66.5	65.6	148	558	853	2391	764	713	262
AC-FT	13400	11980	4080	4090	3640	9090	33220	52470	142300	46950	43830	15590
MAX	412	384	67	68	69	262	948	3610	5080	1250	1370	564
MIN	104	63	65	64	64	65	286	261	1220	450	316	61
CAL YR	2009	TOTAL	217287	MEAN	595	MAX	3100	MIN	57	AC-FT	431000	
WTR YR	2010	TOTAL	191897	MEAN	526	MAX	5080	MIN	61	AC-FT	380600	

MAX DISCH: 5250 CFS AT 09:15 ON Jun. 08,2010 GH 7.7 FT. SHIFT 0.03 FT.

MAX GH: 7.7 FT. AT 09:15 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07099400 ARKANSAS RIVER ABOVE PUEBLO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO
Water Year 2010

Location.--	Lat. 37°43'40", Long. 105°21'03", in sec 5, T.27 S., R.71 W., Huerfano County, on left bank at Manzanares crossing, 500 ft downstream from private bridge, .2 mi downstream from Manzanares Creek, and 3.5 mi southwest of Redwing.
Drainage and Period of Record.--	73 mi ² . Gage established July 1923 by USGS. History of gage prior to April 1946 published in USGS WSP's 1711 and 1731. From April 26, 1946 to September 30, 1972 gage was operated at datum 1.00 ft higher. Monthly discharge only for some periods of record. Gage discontinued from June through September 1977. Gage re-established October 6, 1977 at same location and datum.
Equipment.--	Sutron model 8210 High Data Rate (HDR) satellite-monitored data collection platform (DCP) with shaft encoder and graphic water-stage recorder, inside a 48-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside electric tape gage. A tipping bucket rain gage and temperature sensor are also recorded and transmitted by the DCP. No changes this water year.
Hydrologic Conditions.--	The gage is set in a narrow reach of the Upper Huerfano Valley at an elevation of 8190 feet MSL. Above the gage is a combination of mountainous and high alpine terrain which is subject to flash flooding. Below the gage are several agricultural diversions, which are in a wide valley that extends to the eastern prairie of Colorado.
Gage-Height Record.--	The primary gage height record is hourly averages of 15-minute satellite data, with the DCP log and A-35 chart record used for back-up purposes. The record is complete and reliable, except for the following periods: October 11, 21-23, 26-31; November 15-30; December 1, 2, 2009; March 6-31; April 1-3, 7, 8, 2010, when the stage-discharge relationship was affected by ice; December 3-31, 2009; January 1-31; February 1-28; March 1-5, 2010, when the well was frozen.; and, April 13-May 4, 2010, when the intakes were partially plugged. A +0.25 ft flush correction was found at the May 4 gage visit. This correction was applied starting at 0600 April 13, when the amplitude of the diurnal gage height record was noticeably diminished.
Datum Corrections.--	No levels were run this water year. Levels were last run May 12, 2009 before the weir construction was done. Cross sections were run May 20 after the rock weir was completed; these were used for development of rating 25. A rain event in August 2009 moved some of the rocks in the weir resulting in large positive shifts. Control work was done November 22, 2010 to "plug the hole" and bring shifts in line with rating 25. This will be evaluated in water year 2011 for possible new rating development.
Rating.--	A boulder/rock weir is the current control for stages up to about 3.6 ft (90 cfs). At higher stages the banks (left side is a concrete wing wall and right side covered with grass) become part of the control. Rating No. 25 was used the entire water year; it was developed from cross sections made May 20, 2009 along with a measurement of 93.6 cfs at gage-height of 3.65 ft. It is defined to a gage-height of 5.31 ft and discharge of 400 cfs, approximately four times the historic high measurement. Sixteen discharge measurements (Nos. 482 – 497) were made this water year, ranging in discharge from 9.18 to 106 cfs. They cover the range in stage experienced, except for the lower daily flows of November 15, 22, 23, 25-29; December 2-31, 2009; January 1-3; February 1-28; March 1-11, 14-29 and the higher daily flows of May 28-31, June 1, 4-11, 2010. The peak discharge of 153 cfs occurred at 2130 June 6 at a gage height of 4.00 ft with a shift of +0.04 ft. It exceeded high measurement No. 488 made June 4, 2010 by 0.31 feet in stage.
Discharge.--	Shifting control method was used the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1, 2009 to 1339 May 3 2010 and from 1500 September 29 to the end of the water year. Two shift curves: SC01, based on Msmts 486–488 (in use from 1400 May 3 thru 2130 June 6); and SC02, based on Msmts 490-497 (in use from 2200 June 6 thru 1343 September 29), were used during runoff and through the summer period to account for gage height variability due to runoff from summer thunder storm events. Open water measurements show raw shifts ranging from +0.04 to +0.40 feet. All open water measurements were given full weight and shifts applied accordingly, except for measurement nos. 489, 491, and 493 which were adjusted -3%, 3%, and +9% for smoothing purposes. Measurements 489, 491, and 493 were made using a SonTek FlowTracker ADV (Acoustic Doppler Velocimeter) for comparison to conventional current meter measurements.
Special Computations.--	Discharges for periods of ice effect were estimated based on three discharge measurements (No. 483 – 486), temperature record, partial days of usable data and trends in flow. It should be noted that the measurements during the period of ice were all made in open water, with the well cleared of ice. A hydrograph was used.
Remarks.--	Record good, except during periods of ice effect which are estimated and poor. The period of partial intake plugging from April 13 to May 4 should be considered fair to poor. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO

RATING TABLE--

HURREDCO25 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

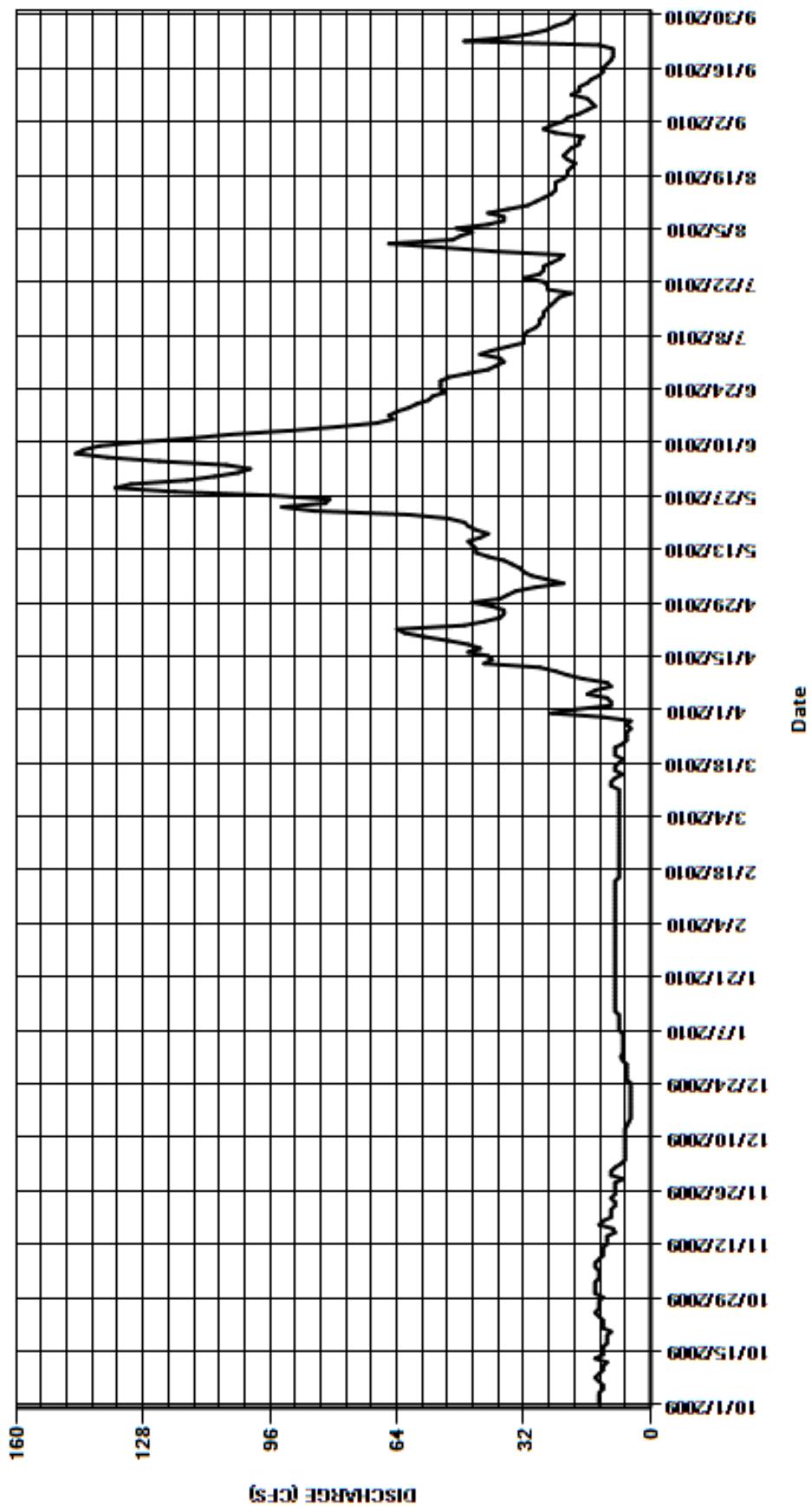
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	14	10	7	9	8	19	36	110	37	66	25
2	13	14	9	7	9	8	10	34	104	38	50	22
3	13	13	7.5	7	9	8	10	29	101	43	48	21
4	13	13	6.5	7	9	8	11	22	107	40	45	18
5	12	13	6.5	7	9	8	16	26	124	36	49	16
6	12	14	6.5	7	9	8	14	30	137	32	41	14
7	13	14	6.5	8	9	8	10	32	145	32	37	15
8	14	13	6.5	8	9	8	11	33	143	32	37	16
9	13	12	6.5	8	9	8	17	35	139	31	41	20
10	12	12	6.5	8	9	8	21	37	129	29	36	18
11	12	12	6.5	8	9	8	24	41	116	28	31	18
12	11	11	6.5	9	9	10	28	44	106	28	29	16
13	14	11	6	9	9	10	42	44	91	27	27	15
14	12	11	5.5	9	9	9	40	45	79	27	25	13
15	12	9	5	9	9	7	41	46	69	26	24	12
16	12	9.5	5	9	8	9	46	43	65	25	24	12
17	11	13	5	9	8	9	43	41	66	24	24	11
18	11	12	5	9	8	8	46	44	64	23	22	10
19	11	10	5	9	8	7	51	46	61	20	21	9.5
20	10	10	5	9	8	9	57	47	59	26	21	9.5
21	12	10	5	9	8	9	62	51	56	26	20	9.5
22	12	9	5	9	8	9	64	61	55	27	19	13
23	12	9	5	9	8	7	47	85	52	32	21	47
24	13	10	5	9	8	6	42	93	53	28	22	36
25	14	9	6	9	8	6	38	82	53	27	21	30
26	13	9	6	9	8	6	37	81	53	27	20	26
27	13	9	6	9	8	5	37	95	51	25	18	24
28	13	9	6	9	8	6	40	120	46	23	18	21
29	12	7	6	9	---	5	45	135	41	22	17	20
30	14	10	7	9	---	12	38	131	39	40	24	19
31	14	---	7.5	9	---	25	---	117	---	53	27	---
TOTAL	386	331.5	191.0	262.0	239.0	262.0	1007	1806	2514	934	925	556.5
MEAN	12.5	11	6.16	8.45	8.54	8.45	33.6	58.3	83.8	30.1	29.8	18.6
AC-FT	766	658	379	520	474	520	2000	3580	4990	1850	1830	1100
MAX	14	14	10	9	9	25	64	135	145	53	66	47
MIN	10	7	5	7	8	5	10	22	39	20	17	9.5
CAL YR	2009	TOTAL	8999.0	MEAN	24.7	MAX	112	MIN	5	AC-FT	17850	
WTR YR	2010	TOTAL	9414.0	MEAN	25.8	MAX	145	MIN	5	AC-FT	18670	

MAX DISCH: 153 CFS AT 21:30 ON Jun. 06,2010 GH 4 FT. SHIFT 0.04 FT.

MAX GH: 4 FT. AT 21:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07111000 HUERFANOR AT MANZANARES XING. NR REDWING CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07112500 HUERFANO RIVER AT BADITO
Water Year 2010

Location.-- Lat. $37^{\circ}43'39''$, Long. $105^{\circ}00'50''$ (Farisita, Colorado quadrangle, 1:24000 scale) in the E $\frac{1}{2}$ SE $\frac{1}{4}$ Sec.5, T27S, R68W, Huerfano County on left bank, 30 feet downstream of the crossing of CR 616 bridge and Huerfano River.

Drainage and Period of Record.-- 532 sq mi. Apr 1, 1923 to Oct 31, 1925; Mar 1, 1938 to Sep 30, 1941; Oct 1, 1946 to Sep 30, 1954; Oct 1, 1993 to Jun 1999; May 4, 2005 to present.

Equipment.-- Sutron Satlink-2 satellite-monitored data collection platform (DCP) attached to a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 6 ft steel shelter. The primary gage is a concrete slope-gage immediately below the orifice. No changes this water year.

Hydrologic Conditions.-- The gage is located at the site of the old Badito jail and settlement approximately 15.2 miles west of interstate 25 on SR 69 elevation 6505 MSL with a drainage area of 532 mi² as the river enters the Colorado prairie. There are several diversions above the gage, primarily for alfalfa irrigation. The river is subject to flash floods with numerous "feeder" streams above the gage.

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite data with DCP and CFB log data used for backup. The record is complete. The reliability of the record is questionable all year due to extreme variability in the unit values. The stage/discharge relationship was affected on the following dates by ice in the channel and/or ice on the control: October 29, 30, November 16-19, 23-26, December 1-22, 25-31, 2009, January 1-31, February 1-28, March 1-7, 15, 16, 19-21, 27, 2010. Mean daily gage height on August 5 is not representative of the flow. Channel work upstream done as a result of the diversion dam failure in water year 2008 still affects the gage. This work which stripped the banks of vegetation gives cause to large amounts of material (mud and rock) and debris to wash downstream and deposit on the control. There were 3 large gage height calibration corrections applied as a result of such debris and deposition.

Datum Corrections.-- No levels were run this water year. Levels were last run on September 3, 2008.

Rating.-- The primary control at all stages is the channel, along with thick bank vegetation downstream and the upstream bridge at higher stages. The concrete control structure at the gage was buried by mud and debris. Due to downstream channel fill and vegetation, shifts have continued to the left of the rating. The channel immediately below the gage narrows and has thick growth on either side. Extreme flows with gage height over 9 feet will go into open field on both sides of the river 300+ feet across. Rating No. 2A dated May 23, 2005 was used all water year. The rating is well defined to about 100 cfs with only a limited number of higher flow measurements. Thirteen discharge measurements (Nos. 123 – 135) were made this water year ranging in discharge from 6.78 to 40.9 cfs. They cover the range in stage experienced except for the lower daily flows of October 11, 15, 17-20, 2009; August 16, 30, 31, September 1, and the higher daily flows of Apr 23, May 23-31, June 1-3, 6-13, July 31, Aug 1 and 7, 2010. The peak discharge of 709 cfs occurred at 0500 August 7, 2010 at a gage height of 3.17 ft (gage height correction of +0.18 ft applied) with a shift of -0.06 ft. It exceeded measurement No.130 made June 4, 2010 by 1.56 feet in stage.

Discharge.-- Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1 2009 to 1130 May 19 2010 and from 1100 September 10 to the end of the water year. Shifts were distributed by stage using two variable stage-shift relationships: HUEBADCOSC01, based on Msmts 128-133, from 1200 May 19 to the peak at 0500 Aug 7; and, HUEBADCOSC02, based on Msmts 128-130, 133-135, used from 0600 Aug 7 to 1030 September 10, 2010. Discharge measurements showed shifts ranging from -0.35 to -0.04 ft, with all measurements being made in open channel. All measurements were given full weight, except Msmts 128-130, 135, which were discounted -5% to +6% to smooth shift distribution.

Special Computations.-- Discharge during periods of ice-effect were estimated based on three measurements (124 – 126), temperature record from the Walsenburg weather station and partial day data. A hydrograph was used with comparison to upstream gage Huerfano River below Manzanares Crossing near Redwing CO.

Remarks.-- Record is considered poor due to the extreme gage height variability caused by debris and silt moving on and off the bubbler orifice and control, ice effect, and lack of precision in the primary reference gage. Station maintained and record developed by Anthony D. Gutierrez,

Recommendations.-- Determine and install a suitable alternative to the concrete slope gage used as a primary reference. Make more frequent measurements and gage visits to ensure debris is not caught on the bubbler orifice.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07112500 HUERFANO RIVER AT BADITO

RATING TABLE--

HUEBADCO02A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.9	19	21	22	20	18	20	38	69	17	42	4.6
2	9.2	17	21	22	20	17	12	37	63	14	25	7.8
3	7.7	18	21	22	20	25	18	29	45	17	18	14
4	8.6	18	21	22	20	25	19	25	40	21	20	12
5	9.5	18	21	20	20	25	17	23	41	17	23	9.9
6	9.5	18	21	20	20	24	15	25	61	14	23	10
7	9	18	21	20	19	27	15	34	94	15	64	11
8	8.2	16	21	20	18	24	22	35	87	24	18	13
9	7.8	16	21	22	18	21	22	32	92	19	16	14
10	6.8	15	21	22	22	29	18	34	76	17	12	13
11	6.1	15	21	22	22	19	21	36	59	13	13	15
12	8.3	15	21	22	22	20	18	34	51	12	11	15
13	7.9	15	21	22	22	21	12	36	50	13	9.9	13
14	7.5	13	21	22	22	22	15	35	35	13	9	12
15	6.7	12	21	22	22	20	30	40	21	15	8.1	12
16	6.9	11	21	22	22	21	33	40	15	15	6.6	11
17	5.6	11	21	20	22	26	28	33	14	17	7.7	11
18	4.3	11	21	20	20	26	25	36	18	15	8.9	11
19	3.7	11	21	20	22	24	29	32	12	14	8.8	11
20	6.2	12	21	20	19	18	26	26	8.6	11	10	11
21	10	13	21	20	19	28	30	30	9.8	13	11	11
22	11	13	21	20	22	30	35	38	8.3	13	10	12
23	10	12	22	20	24	30	45	51	10	14	11	17
24	11	16	22	20	26	29	30	62	10	17	13	8.7
25	11	20	23	20	20	21	36	51	17	15	15	7.1
26	14	17	23	20	23	24	40	46	28	17	13	12
27	13	17	23	20	18	31	37	58	25	13	8	14
28	14	16	23	20	18	31	40	98	28	12	8.9	15
29	15	15	22	20	---	24	43	110	19	11	8.1	15
30	17	21	22	20	---	37	39	93	15	26	4.7	15
31	20	---	22	20	---	37	---	93	---	43	3.6	---
TOTAL	294.4	459	664	644	582	774	790	1390	1121.7	507	460.3	358.1
MEAN	9.5	15.3	21.4	20.8	20.8	25	26.3	44.8	37.4	16.4	14.8	11.9
AC-FT	584	910	1320	1280	1150	1540	1570	2760	2220	1010	913	710
MAX	20	21	23	22	26	37	45	110	94	43	64	17
MIN	3.7	11	21	20	18	17	12	23	8.3	11	3.6	4.6

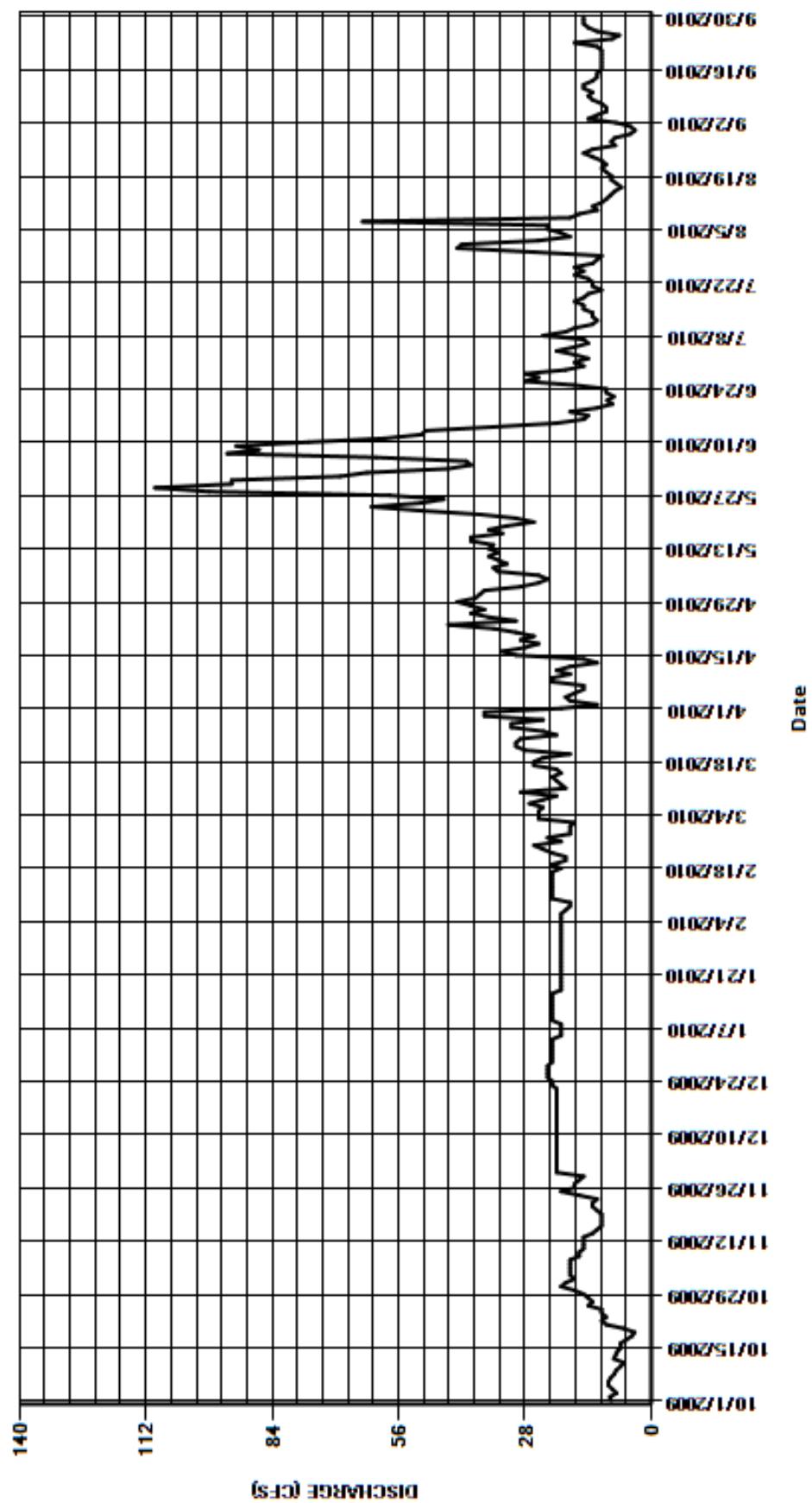
CAL YR	2009	TOTAL	6835.2	MEAN	18.7	MAX	131	MIN	3.7	AC-FT	13560
WTR YR	2010	TOTAL	8044.5	MEAN	22	MAX	110	MIN	3.6	AC-FT	15960

MAX DISCH: 709 CFS AT 05:00 ON Aug. 07,2010 GH 3.17 FT. SHIFT -0.06 FT. (+0.18 FT. GH CORR. APPLIED)

MAX GH: 3.18 FT. AT 05:00 ON Aug. 07,2010 (+0.18 FT. GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07112500 HUERFANO RIVER AT BADITO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
Water Year 2010

Location.--	Latitude 37° 25' 12", Longitude 105° 03' 08" (Cuchara, Colorado quadrangle, 1:24000 scale) in the SE¼ NE¼ SE¼ Sec.24, T30S, R69W, Huerfano County on left bank at Boyd Ranch, 29 feet downstream from private bridge, 6.5 miles southwest of La Veta CO on Highway 12.
Drainage and Period of Record.--	56 mi ² . Established October 1, 1934 by the State Engineer's Office. Record has been intermittently published by the USGS and the State Engineer's Office. The Colorado State Engineer's Office published the record from water years 1979 to 1987 and again from 1995 to the current water year.
Equipment.--	Sutron model 8210 satellite-monitored data collection platform (DCP) with a High Data Rate (HDR) radio transmitter, with shaft encoder and graphic water-stage recorder in a 4 ft x4 ft x 8 ft steel shelter over 48-inch corrugated pipe well. Shaft encoder and chart are set to the reference mark on the front of the equipment shelf using a drop-tape. A temperature sensor is also connected to the DCP. There is no outside staff gage. No changes this year.
Hydrologic Conditions.--	The gage is located in a gentle slope section of the Cucharas River Valley at an elevation of approximately 7,790 feet by topographic map. Drainage area is approximately 56 sq. mi. (US Army Corps of Engineers). There are several diversions upstream of the gage for agriculture and the town of Cuchara. State Highway 12 is parallel to the right riverbank at an elevation of approximately 10 feet higher than pastureland adjacent to the left bank. Flooding would spill into the pasture on the left before flooding the highway. The gage is subject to freezing during the winter months.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with DCP log and graphic chart record used for back-up purposes. Record is complete and reliable, except for the following periods: October 21, 22, 26, 28-31; November 15-30; December 1-3, 2009, when the stage-discharge relationship was affected by ice; December 4-31, 2009, January 1-31, February 1-28, March 1-31, April 1-20, 2010, when the well was frozen and the floats were trapped in the ice and the river was also ice covered, with ice on the control; and April 22-May 11, 2010, when the intake valves were inadvertently left closed. Five large flush corrections were applied to the record, ranging from +0.05 ft to +0.14 ft. The new control causes considerable silt to deposit in the weir pool.
Datum Corrections.--	No levels were run this year. Previous levels were run April 24, 2009.
Rating.--	The control is a rock weir constructed in April 2009. It is rated for flows up to 350 cfs by cross section. Flows higher than 350 cfs are controlled by the brush-lined bank on the right side and the left bank, which was constructed using 4 – 8 inch cobble with large rocks lining the bottom of the bank. Rating No. 15 dated June 1, 2009 was used the entire water year. Rating 15 was developed as a result of the weir construction. Shifts for Rating 15 are plotting slightly to the right. As the weir and channel stabilize, this will be adjusted accordingly. Thirteen discharge measurements (Nos. 533 – 545) were made and ranged in discharge from 6.57 cfs to 104 cfs. They cover the range in stage experienced, except for the lower daily flows of November 27-January 16, January 22-Mar 7, Mar 11, 12, 15, 16, and the higher flows of May 5, 21-24, 29-31, June 1, 6-10. The peak discharge of 130 cfs occurred at 0030 May 30, 2010 at a gage height of 2.90 ft (gage height correction of +0.03 ft applied) with a shift of +0.14 ft. It exceeded Measurement 539 which was made on May 25 by 0.20 feet in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time from 0000 October 1, 2009 to 1235 April 22 2010, and from 0400 August 25 to the end of the water year. Shifts were distributed by stage using variable stage shift relationship: CBRRLVCOSC01, based on Msmts 537-544, for the period 1300 April 22 to 0300 August 25. Measurements showed shifts varying from -0.01 to +0.17 ft. All open water measurements were given full weight, except Measurements 537, 538, 540-542, 544, which were adjusted from -5% to +6% for smoothing purposes.
Special Computations.--	Discharges for periods of ice-affected record were estimated based on four measurements (Nos. 534 – 537), air temperature data collected at the gage, and a hydrograph. Discharges were computed for the period April 22 to May 11 when the intake valves were closed by applying the change in gage height upon valve opening as a prorated correction to the gage height data for that period.
Remarks.--	The record is good, except during periods of ice effect which are estimated and poor. The period of April 22 to May 11 is also poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA

RATING TABLE--

CRBRLVCO15 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	13	4	5	6	5	12	97	108	29	29	15
2	9.7	12	3.5	5	6	6	10	104	104	28	38	16
3	9.8	13	4	5	6	6	12	100	100	27	68	16
4	9.8	13	4	4	6	6	14	98	98	25	48	15
5	9.7	13	4	4	6	6	14	114	102	25	41	15
6	10	14	5	5	6	6	12	91	112	23	36	14
7	11	16	4	5	6	6	10	74	117	24	33	14
8	15	16	4	4	6	7	12	78	114	24	30	14
9	12	14	4	4	5	7	14	84	111	23	34	14
10	11	13	4	4	4	7	14	95	105	21	33	14
11	10	12	5	5	4	6	18	93	95	21	27	13
12	9.4	12	5	5	4	6	22	91	86	21	26	13
13	9.8	12	5	6	4	7	28	83	80	20	25	13
14	9.2	12	5	6	5	7	34	72	73	20	24	12
15	8.7	8	5	6	4	6	30	71	69	20	22	11
16	7.9	10	6	6	4	6	30	78	64	19	23	11
17	7.9	12	6	7	4	8	36	82	61	19	23	10
18	8	12	5	7	4	9	44	93	56	19	21	10
19	8.1	9	5	7	5	10	54	99	53	18	21	9.9
20	8.6	8	5	7	5	9	64	103	49	19	20	9.7
21	11	8	6	7	5	9	71	112	46	19	20	10
22	11	8	6	6	4	10	81	117	43	21	20	11
23	11	7	5	6	4	11	81	119	40	20	24	12
24	11	8	5	5	4	11	69	113	38	19	26	10
25	12	8	4	5	5	9	67	104	36	20	21	10
26	11	8	4	5	5	9	70	92	35	18	19	9.8
27	11	6	4	6	5	10	73	87	34	16	19	9.3
28	11	6	4	6	5	9	86	71	35	16	18	9.2
29	11	3	4	5	---	10	101	124	32	16	17	8.9
30	13	5	4	5	---	12	98	124	29	18	17	8.6
31	13	---	4	5	---	12	---	115	---	45	16	---
TOTAL	321.6	311.0	142.5	168.0	137.0	248.0	1281	2978	2125	673	839	358.4
MEAN	10.4	10.4	4.6	5.42	4.89	8	42.7	96.1	70.8	21.7	27.1	11.9
AC-FT	638	617	283	333	272	492	2540	5910	4210	1330	1660	711
MAX	15	16	6	7	6	12	101	124	117	45	68	16
MIN	7.9	3	3.5	4	4	5	10	71	29	16	16	8.6

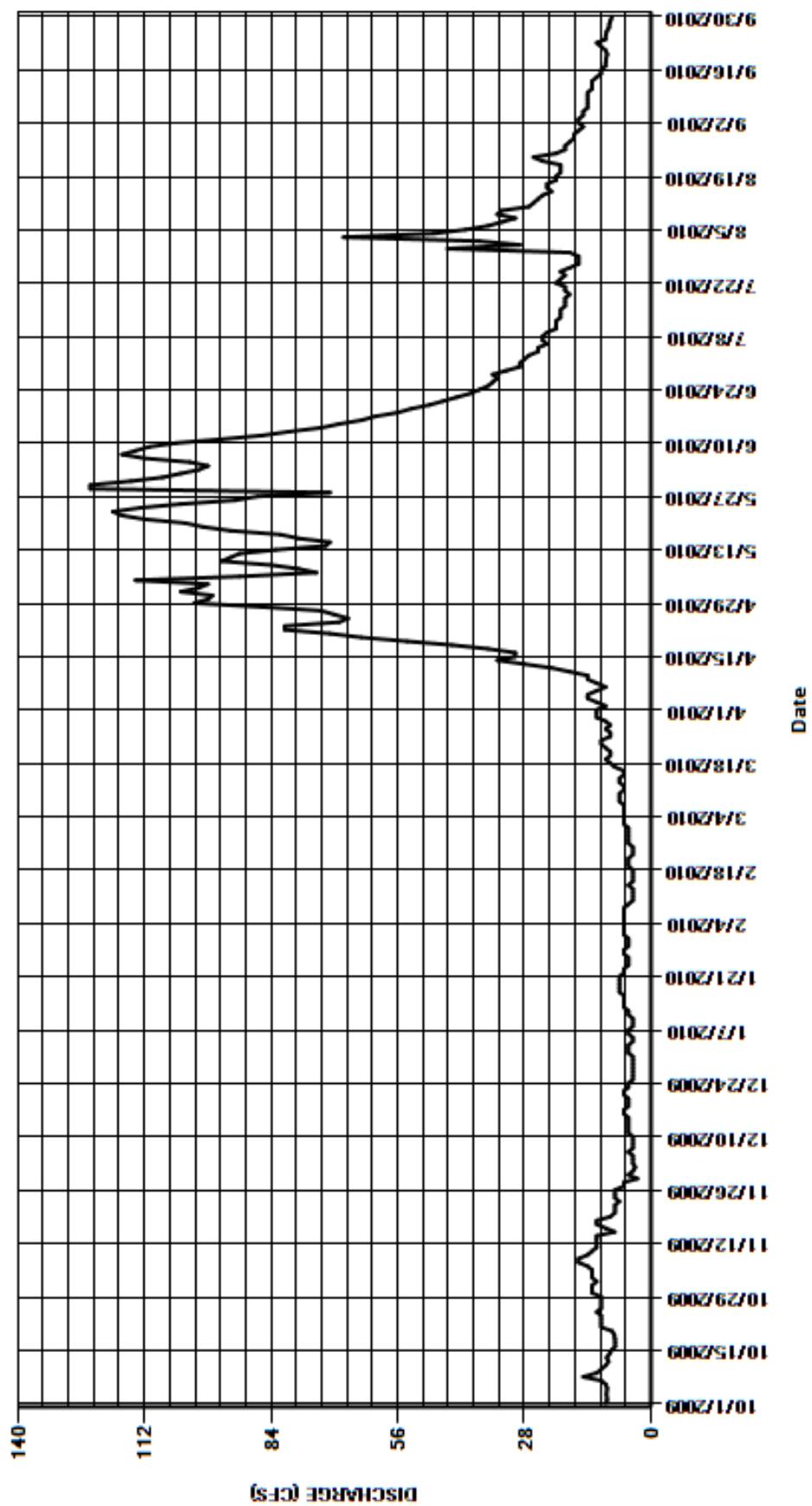
CAL YR	2009	TOTAL	6068.8	MEAN	16.6	MAX	72	MIN	3	AC-FT	12040
WTR YR	2010	TOTAL	9582.5	MEAN	26.3	MAX	124	MIN	3	AC-FT	19010

MAX DISCH: 130 CFS AT 00:30 ON May. 30,2010 GH 2.9 FT. SHIFT 0.14 FT. (+0.03 GH CORR. APPLIED)

MAX GH: 2.9 FT. AT 00:30 ON May. 30,2010 (+0.03 GH CORR. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO
Water Year 2010

Location.-- Lat. 37°33'02", Long. 104°56'11", in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.6, T29S, R67W Huerfano County, on right bank at the Valley Road Harrison Bridge crossing of Cucharas River approximately $\frac{3}{4}$ mile south of the intersection of Valley Road and Highway 160.

Drainage and Period of Record.-- 196.16 sq.mi.

Equipment.-- Sutron model 8210 satellite-monitored data collection platform (DCP) and shaft encoder. The DCP is housed inside a 4 ft x 4 ft metal shelter at a higher elevation than the riverbank on the right side, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an 18 inch diameter CMP stilling well attached to the center pier of Harrison Bridge. The shaft encoder is set using an electric tape inside of the well. No changes this water year.

Hydrologic Conditions.--

Gage-Height Record.-- The primary record is hourly averages of 15-minute DCP log data with satellite data used for back-up purposes. Record is complete and reliable except for the following periods: Oct 30, Nov 16-18, 24-26, 30, Dec 1, Jan 13-21, 23, Feb 2, 6-8, 24, 27-28, when the stage-discharge relationship was affected by ice on the control; and, Dec 2-31, Jan 1-12, 24-31, Feb 1, 3-5, 9-18, 21-23, 25, 26, when the well was frozen.

Datum Corrections.-- No levels were run this year. Levels were last run Apr 4, 2007.

Rating.-- The control at low and medium flows up to 50 cfs is the shifting sand and gravel bed in the river channel. At medium to high stages the riverbanks and brush lining the edges of the channel as well as the center bridge pier, become part of the control. High flows of up to approximately 2000 cfs should be contained by the bridge. Extreme high flows can go out of channel to the flood plain north of the bridge, which is at a slightly lower elevation, and extends for approximately 200 feet to the north. Rating No. 2, dated Oct 1, 2003, was used the entire water year. Rating No. 2 was developed using measurement history and a theoretical rating extension based on channel survey work and is well-defined to about 500 cfs. Eleven discharge measurements (No. 118 to 128) were made during water year. Measured discharges ranged from 3.34 cfs to 177 cfs. They cover the range in stage experienced, except the lower daily flows of Oct 1-7, 17, 19-20, 2009, Sept. 14-22, 26-30, 2010; and the higher daily flows of April 21-23 and July 31, 2010. The peak discharge of 295 cfs occurred at 1145 on July 31, 2010 at a gage height of 3.40 ft with a shift of -0.27 ft. It exceeded the highest measured flow (No.121, 177cfs) made on April 22, 2010 by 0.27 feet in stage.

Discharge.-- Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time from 0000 Oct 1, 2009, to 1305 Mar 23, 2010, then again from 1500 Sept. 14, 2010 to the end of the water year. Shifts were distributed by stage using one variable stage-shift relationship: CRHBLVCOSC01, based on Msmts 120-128, from 1400 March 23 to 1400 Sep 14, 2010. Open water measurements indicated shifts varying from -0.27 to -0.02 feet. Measurements were given full weight and applied directly, except for Msmts 120 and 122-126, which were discounted from -5% to +7% to smooth shift distribution. WY10 measurements were generally rated 'fair' to 'poor'. Measurements have continued to show shifts moving to the left, which indicates that the control is continuing to change as noted in the 2009 record.

Special Computations.-- Discharge for periods of ice-affected record was estimated utilizing Msmt 119, observations of ice, and temperature records from the NWS Walsenburg weather station, and partial days of usable record. A hydrograph was used comparing with the upstream station Cucharas River at Boyd Ranch near La Veta CO.

Remarks.-- Record is fair, except during periods of ice effect and no gage height, which are poor. Station maintained Anthony Gutierrez and record developed by Steve Anselmo .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO

RATING TABLE--

CRHBLVCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

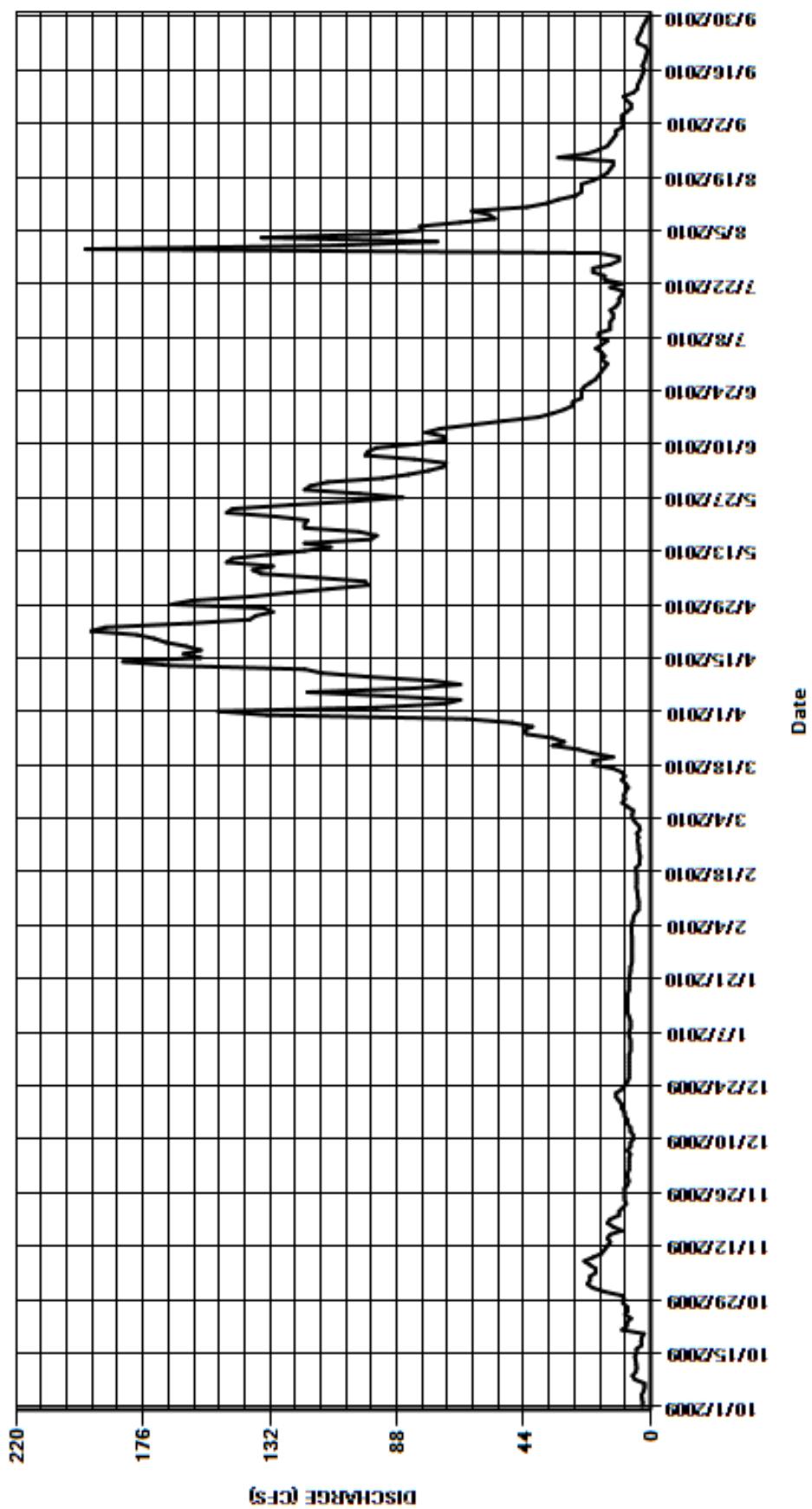
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	20	8	7.5	6.5	3.7	150	139	93	15	108	9.7
2	2.7	22	7.5	7	6.6	4.1	95	126	84	17	74	9.7
3	3	21	7.5	7	6.6	5.4	71	112	77	16	135	10
4	3.1	21	7.5	7	6.6	6.3	66	98	72	17	94	9.9
5	2.4	19	7.5	7	6.2	6.4	92	99	71	19	79	8.2
6	2.1	19	7	7.5	6	6	119	116	82	17	80	6.7
7	2.1	21	8	7.5	5.4	8	82	135	99	15	66	6.8
8	5.5	23	7	7	4.2	9.8	66	138	98	18	54	8.4
9	6.3	20	7	7	4.2	9	76	131	95	18	56	9.4
10	5.1	17	6	7	4.1	9.3	98	147	81	14	62	6
11	4.9	16	6	7.5	4.4	8.7	114	145	71	14	43	4.6
12	5	15	7	8	4.5	7.8	120	133	72	14	36	4.5
13	5.2	14	7	8	4.7	8.6	167	120	78	13	32	3.8
14	5.5	15	8	8	5	10	183	111	73	13	26	3.2
15	4.8	14	8	8	4.8	9	156	120	62	14	24	2.7
16	4.9	10	9	8	4.8	9.9	162	97	51	12	24	2.2
17	3.1	13	9	8	4.8	13	156	95	39	11	24	2.9
18	3.3	15	10	7.5	5	20	161	101	34	11	20	2.2
19	3.1	14	10	7.5	5.1	20	168	120	30	10	17	1.8
20	2.3	11	11	7.5	3.8	13	172	120	27	9.4	15	1.4
21	9.9	11	12	7.5	3.8	20	178	119	27	14	14	1.1
22	8.3	9.6	12	7.2	3.6	25	194	130	24	10	13	1.7
23	8.2	8.5	10	7	4	34	189	147	24	16	13	4.5
24	6.8	9	9	7	4.2	30	160	145	24	16	32	4.7
25	8.9	9	8	6.5	4.2	34	139	125	23	20	22	4
26	7.9	9	7.5	6.5	4.6	43	137	103	21	20	18	3.3
27	8.1	9.1	7.5	6.5	4.2	44	131	86	19	14	15	2.9
28	9.6	8	7.5	6.5	4.8	41	134	101	18	11	14	2.2
29	9.1	7.6	7.5	6.5	---	48	166	120	17	11	13	1.4
30	10	8	7.5	6.5	---	64	159	118	16	18	12	1.1
31	16	---	7.5	6.5	---	133	---	112	---	196	12	---
TOTAL	180.1	428.8	254.0	223.7	136.7	704.0	4061	3709	1602	633.4	1247	141.0
MEAN	5.81	14.3	8.19	7.22	4.88	22.7	135	120	53.4	20.4	40.2	4.7
AC-FT	357	851	504	444	271	1400	8050	7360	3180	1260	2470	280
MAX	16	23	12	8	6.6	133	194	147	99	196	135	10
MIN	2.1	7.6	6	6.5	3.6	3.7	66	86	16	9.4	12	1.1
CAL YR	2009	TOTAL	4967.19	MEAN	13.6	MAX	92	MIN	0	AC-FT	9850	
WTR YR	2010	TOTAL	13320.7	MEAN	36.5	MAX	196	MIN	1.1	AC-FT	26420	

MAX DISCH: 295 CFS AT 11:45 ON Jul. 31,2010 GH 3.4 FT. SHIFT -0.27 FT.

MAX GH: 3.4 FT. AT 11:45 ON Jul. 31,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
OXFORD FARMERS DITCH COMPANY
Water Year 2010

Location.--	Lat. 38°10'34", Long. 104°08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, approximately 0.33 mi upstream from Arkansas River at Nepesta Rd. Bridge river gage.
Drainage and Period of Record.--	N/A
Equipment.--	Sutron SatLink DCP/logger with High Data Rate radio and shaft encoder in a stilling well inside a wood frame shelter. A float-activated A-35 graphic water-stage recorder is also in the stilling well. Primary reference gage is outside staff gage installed in flume. No changes this water year.
Hydrologic Conditions.--	The Oxford Farmers ditch diverts water from the Arkansas River upstream from the Nepesta gage approximately 0.40 miles. The ditch company owns a variety of direct flow water rights and receives Winter Water and Fry-Ark Project water from Pueblo Reservoir. Pueblo Reservoir regulates flows throughout the water year and is located approximately 43 miles upstream from the gage with a travel time of approximately 18 hours. Non-regulated inflows to the Arkansas River below Pueblo Reservoir and above the gage include Fountain Creek, St. Charles River and the Huerfano River. The influence of urbanization provides the largest affect to the runoff regime. No hydrologic condition changes this water year
Gage-Height Record.--	Primary record is the hourly average of 15-minute satellite-monitored data with DCP log data and the graphic chart recorder used for backup purposes. Record is complete and reliable for this seasonally operated gage. For the period from November 15 to March 15, there is no flow in the ditch as the company participates in the Winter Water Storage Program in Pueblo Reservoir. From March 15 to November 15, the well is open and the shaft encoder was working properly.
Datum Corrections.--	No levels were run to the flume this water year.
Rating.--	The control is a standard, 12-foot, concrete Parshall Flume. A standard 12-ft Parshall Flume table was used all year. No discharge measurements were made this year. Measurement number 13 and 14 (respectively made April 15, 2009 and October 7, 2010) both computed zero shifts thus the standard rating was deemed valid. The peak flow of 131 cfs occurred at 0915 on June 2, 2010 at a gage height of 1.90 feet with a shift of 0.00 ft.
Discharge.--	Shifting control method was used for the entire water year. A zero shift based on measurements from water years 2009 and 2011 was applied to the entire WY2010 period of record. The well and flume were cleaned five times between April and September. A shift of 0.00 was used for the irrigation year.
Special Computations.--	During periods of flume cleaning, gage height data was adjusted through the use of datum corrections which yielded zero flow.
Remarks.--	Record is considered fair due to the sand and moss buildup that occurs in the flume during the irrigation season, which would introduce uncertainty into the actual shift that should be applied afterwards, and also due to the poor precision of the gage heights (chatter) measured in the stilling well. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road Bridge below the Oxford diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the Oxford Ditch mean daily discharge is combined with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Station maintained and record developed by Anthony D. Gutierrez
Recommendations.--	A levels survey and flume inspection should be performed during the non irrigation season to confirm the floor elevations and the position of the staff gage. The flume should be measured every water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OXFORD FARMERS DITCH COMPANY

RATING TABLE--

STD12FTP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	41	0	0	0	0	80	104	95	116	92	46
2	13	41	0	0	0	0	79	103	97	80	119	46
3	13	42	0	0	0	0	79	103	111	50	119	46
4	14	42	0	0	0	0	79	122	116	50	111	46
5	14	42	0	0	0	0	80	126	26	52	0	45
6	14	42	0	0	0	0	79	127	0	51	16	47
7	14	41	0	0	0	0	94	122	115	52	97	47
8	13	60	0	0	0	0	102	65	121	50	112	47
9	13	82	0	0	0	0	102	50	120	53	111	43
10	13	82	0	0	0	0	101	101	123	51	118	20
11	13	83	0	0	0	0	101	67	126	51	119	14
12	14	83	0	0	0	0	101	51	127	48	119	14
13	13	83	0	0	0	0	102	51	127	47	120	16
14	13	82	0	0	0	0	102	84	128	54	111	17
15	13	0.3	0	0	0	30	103	103	127	53	113	14
16	13	0	0	0	0	29	21	102	127	51	111	12
17	13	0	0	0	0	62	0	102	127	49	58	13
18	13	0	0	0	0	78	4.5	101	126	51	49	14
19	13	0	0	0	0	59	50	102	125	52	49	15
20	13	0	0	0	0	42	71	103	124	54	49	14
21	24	0	0	0	0	42	98	103	124	53	51	15
22	42	0	0	0	0	79	104	103	123	119	52	2.7
23	43	0	0	0	0	79	80	103	123	114	51	0
24	43	0	0	0	0	78	51	103	123	80	53	6
25	43	0	0	0	0	78	51	102	123	52	99	14
26	43	0	0	0	0	78	68	102	26	50	109	14
27	43	0	0	0	0	79	96	104	0	52	68	14
28	42	0	0	0	0	79	104	105	108	46	48	15
29	43	0	0	0	---	79	104	105	118	53	45	19
30	42	0	0	0	---	78	104	105	116	53	48	19
31	42	---	0	0	---	79	---	103	---	48	47	---
TOTAL	715	846.30	0.00	0.00	0.00	1128.00	2390.50	3027	3172.00	1835	2464.00	694.70
MEAN	23.1	28.2	0	0	0	36.4	79.7	97.6	106	59.2	79.5	23.2
AC-FT	1420	1680	0	0	0	2240	4740	6000	6290	3640	4890	1380
MAX	43	83	0	0	0	79	104	127	128	119	120	47
MIN	13	0	0	0	0	0	0	50	0	46	0	0

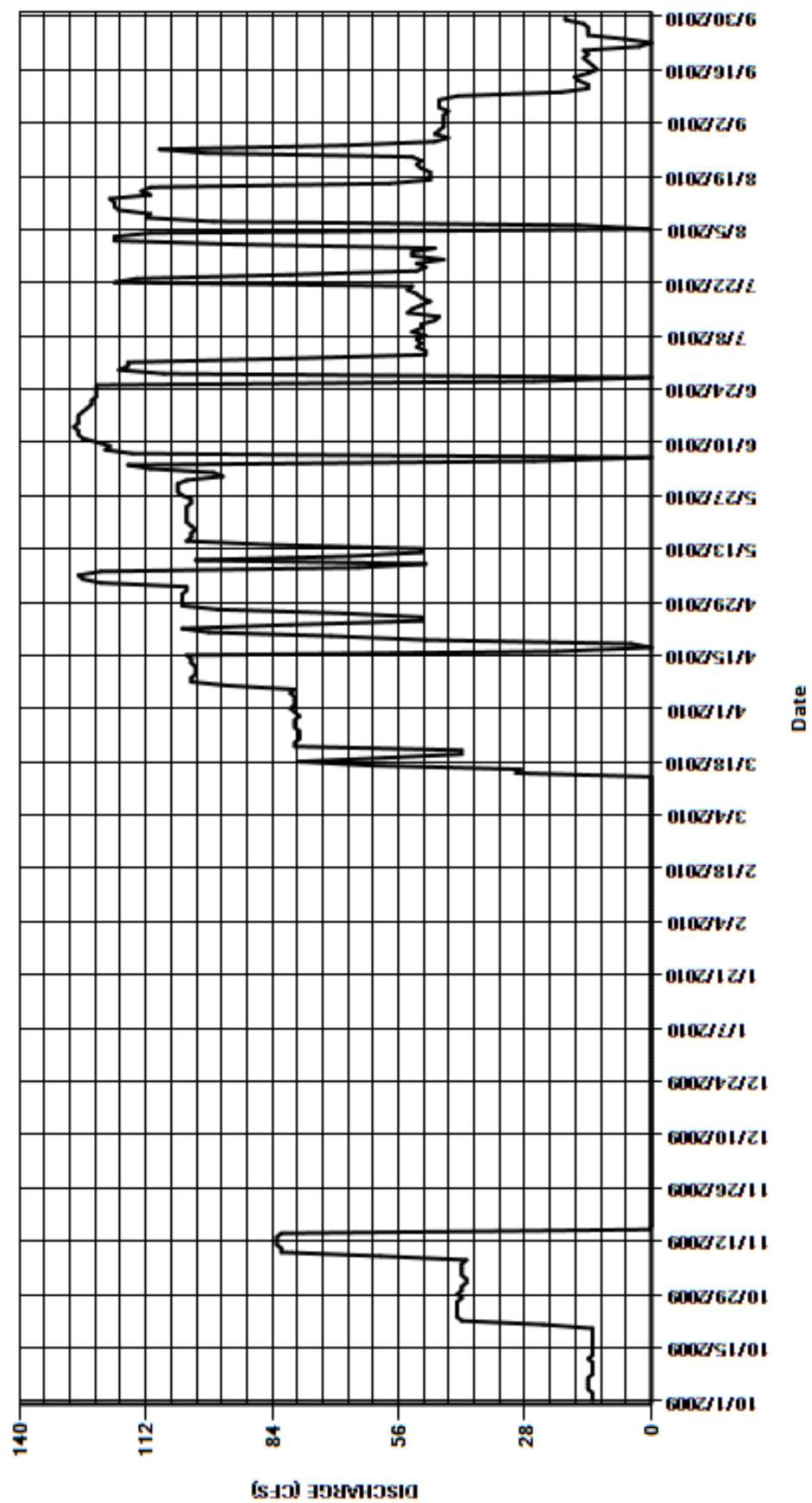
CAL YR	2009	TOTAL	15127.50	MEAN	41.4	MAX	134	MIN	0	AC-FT	30010
WTR YR	2010	TOTAL	16272.50	MEAN	44.6	MAX	128	MIN	0	AC-FT	32280

MAX DISCH: 131 CFS AT 09:15 ON Jun. 02,2010 GH 1.9 FT. SHIFT 0 FT.

MAX GH: 1.9 FT. AT 09:15 ON Jun. 02,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OXFORD FARMERS DITCH COMPANY
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
Water Year 2010

Location.--	Lat. 38°10'44", Long. 104°08'20", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, on the left bank downstream side of the Nepesta Road Bridge crossing the Arkansas River, 0.8 mi downstream of Kramer Creek, 9 mi downstream from Huerfano River, 1 mile NNW of the Nepesta Cemetery.
Drainage and Period of Record.--	9,345 mi ² of which 54 sq.mi. is probably noncontributing (furnished by the U.S Army Corp of Engineers). Established May 1, 1901. Intermittent record until June 1921 at various sites and datums above the current site. From June 1921 to September 30, 2000 at various sites within 2 miles of the present site. At present site October 1, 2000 through current water year.
Equipment.--	Sutron 8210 High Data Rate satellite-monitored data collection platform (DCP) with data logger and Sutron Accubar with constant nitrogen bubbling using a site feed assembly with purge in a 4 ft x 4 ft steel shelter. The primary reference gage is a wire weight located in the same river section as the end of the Accubar orifice line with muffler and attached to the bridge approximately 120 ft south of the gage shelter. A temperature sensor is monitored and logged by the DCP. No changes were made this water year.
Hydrologic Conditions.--	The gage is located at the Pueblo County Road 613 bridge over the Arkansas River on a fairly straight stretch of river that extends from 800 feet upstream to a half mile downstream of the gage. The gage elevation is 4380 ft MSL. The riverbed consists of moving sand at all stages. Upstream sluice outlets from the Colorado Canal, Rocky Ford Highline Canal and Oxford Farmers Ditch as well as Fountain Creek contribute a supply of loose sand, especially during the irrigation season and high water. The channel width is 280 feet at the gage and widens considerably above and below the gage. The contributing drainage area is 9,340 square miles (furnished by the Army Corp of Engineers). The upper basin consists of mountain topography above Pueblo Reservoir. The lower basin consists of several unregulated tributaries below Pueblo (Fountain Creek, Salt Creek, the St. Charles River, Six Mile Creek, and the Huerfano River), large agricultural areas, and urban runoff from Pueblo and Colorado Springs.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable, except for the periods: November 17, 18, 24 – 27; December 1 – 31, 2009; January 1 – 31; February 1 – 17, 20 – 24, 2010 when ice at or near the gage affected the stage-discharge relationship.
Datum Corrections.--	Levels were last run May 4, 2009 to the wire weight check-bar using RM No. 1 as base. No corrections needed.
Rating.--	The primary control at all stages is a shifting sand channel at and downstream of the gage. At the gage, the channel is contained by the county road bridge and the railroad bridge, which is 30 feet upstream. Flows of up to approximately 5000 cfs are contained in a well-defined channel under the bridge. At higher flows, large riprap, which continues up to the bottom of the bridge, and heavy vegetation on both banks below the bridge, become part of the control. Backwater flow is avoided by the elevation of the road and a large fan area below the gage. The rating is well defined to 25,000 cfs by high water mark on the bridge and indirect measurement made in May 1999. Discharge measurements of up to 1500 cfs can be made approximately 400 – 500 feet downstream of the bridge, with higher flows measured from the bridge. Extremely low discharge measurements (less than 50 cfs) are made as much as a quarter of a mile upstream, near the Oxford Farmers Ditch flume. Rating No. 16 was used the entire water year. This rating was developed as the result of large negative shifts in previous years, this rating incorporated both high flow (USGS indirect measurement) and extreme low flows (due to drought conditions). Estimated PZF is 10.42 ft. Fifteen discharge measurements (Nos. 205 – 219) were made this water year ranging in discharge from 168 to 2310 cfs. All measurements were made in open water by either wading or bridge crane. They cover the range in stage experienced except for the lower daily flows of February 15 – 27; March 1 – 9, 13, 14; September 26 – 27, 2010 and the higher daily flows of June 7 – 13. The peak discharge of 4150 cfs occurred at 2330 June 9, 2010 at a gage height of 15.29 ft (gage height correction of +0.07 ft applied) with a shift of -0.18 ft. It exceeded measurement No. 213 made June 1 by 0.94 feet in stage.
Discharge.--	Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from October 1 2009 to 1200 May 5 2010 and from 0000 August 17 to end of the water year. Two variable shift curves were applied: ARKNEPCOSC01, from 1300 May 13 to 2345 June 9 and ARKNEPCOSC02 from 0000 June 10 to 2330 August 16. Discharge measurements showed shifts ranging from -0.48 ft to +0.04 ft, with all measurements being made in open channel. Measurements 206 – 208 were all made in open and clear channel conditions, which were preceded and followed by periods of ice affected gage height. All measurements were given full weight with the exception of measurement 207, 208, and 217, which were discounted from -2 to +2 percent for smoothing purposes.
Special Computations.--	The shift change on November 15, 2009 (starting at -0.03 feet to -0.15 feet) was made as a result of the Rocky Ford Highline Canal and the Oxford Farmers Ditch shutting off for the Winter Water Storage, which resulted in a large deposition of sand at the gage. The shift change on January 11, 2010 (starting at -0.23 feet to -0.48 feet) is a result of ice moving through the channel leaving behind a large amount of sand during the ice period. Hydrographs of the upstream gages Arkansas River at Avondale, Rocky Ford Highline Canal, and Oxford Farmers Ditch were reviewed to help with estimated "ice" discharges. Shift curve ARKNEPCOSC01 was started using measurement 212 rather than 210 due to the small amount of gage-height (12.79 – 12.87 and shift (-0.27 and -0.25) change for measurements 210 and 211, with large discharge changes during that time period. The shift of -0.11 ft for measurement 212 (similar gage-heights for 210, 211, and 212) was determined to occur on May 13 starting the shift curve and ending immediately after the peak on June 9. Shift curve ARKNEPCOSC02 was run from June 10 to an event on August 16. Estimated flow during periods of ice effect and Accubar malfunction were made using adjacent good gage height and the temperature sensor data.

Remarks.--

Record is considered fair due to the number of discharge measurements made this water year, except for periods of ice affected gage height, during which the record is considered poor. The stage-discharge relationship has continued to shift left (indicative of channel fill) since the drought of 2002. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO

RATING TABLE-- ARKNNEPCO16 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	301	630	338	365	200	162	504	1080	2300	1040	812	392
2	333	623	328	360	200	162	691	1330	2070	1090	868	387
3	344	570	310	340	209	160	711	865	1780	1080	1050	385
4	333	563	315	345	220	159	638	778	1500	892	1540	374
5	322	544	315	355	215	152	608	683	1860	885	1700	369
6	320	526	315	359	210	159	532	626	1890	846	1110	363
7	318	545	335	350	205	160	509	593	2740	760	1270	362
8	318	525	340	340	200	156	463	629	3250	734	1200	368
9	306	511	350	355	210	167	429	612	3610	807	834	348
10	295	510	340	350	220	191	401	477	3330	838	960	336
11	299	549	335	270	210	204	385	468	2440	715	770	328
12	353	551	330	250	200	194	438	460	2510	626	658	320
13	405	535	325	232	200	166	572	596	2440	489	664	318
14	468	541	320	213	185	164	838	649	2060	573	704	316
15	436	638	315	221	160	203	981	652	1990	651	656	320
16	391	479	315	228	145	330	1030	771	1620	605	710	306
17	381	450	320	217	147	327	883	899	1440	585	398	353
18	357	390	320	209	146	306	960	869	1380	590	340	380
19	339	378	325	209	145	304	992	758	1170	580	377	370
20	328	362	330	224	145	324	968	712	1030	638	389	347
21	364	370	335	224	146	337	869	712	977	717	405	317
22	606	374	340	209	150	318	886	699	1140	889	415	256
23	516	362	340	198	154	318	1060	767	1250	621	403	194
24	486	355	335	206	150	307	1170	886	1310	602	417	185
25	492	348	335	213	147	269	1030	1090	1300	592	434	177
26	462	345	340	217	150	293	1190	1320	1390	566	401	166
27	442	343	340	224	160	301	1100	1560	1230	580	389	141
28	421	341	340	213	168	411	1030	1230	1190	555	393	149
29	406	348	345	228	---	443	961	1180	1190	462	389	181
30	490	349	335	213	---	430	942	1630	1170	424	387	168
31	587	---	340	213	---	454	---	2170	---	881	394	---
TOTAL	12219	13955	10246	8150	4997	8031	23771	27751	54557	21913	21437	8976
MEAN	394	465	331	263	178	259	792	895	1819	707	692	299
AC-FT	24240	27680	20320	16170	9910	15930	47150	55040	108200	43460	42520	17800
MAX	606	638	350	365	220	454	1190	2170	3610	1090	1700	392
MIN	295	341	310	198	145	152	385	460	977	424	340	141

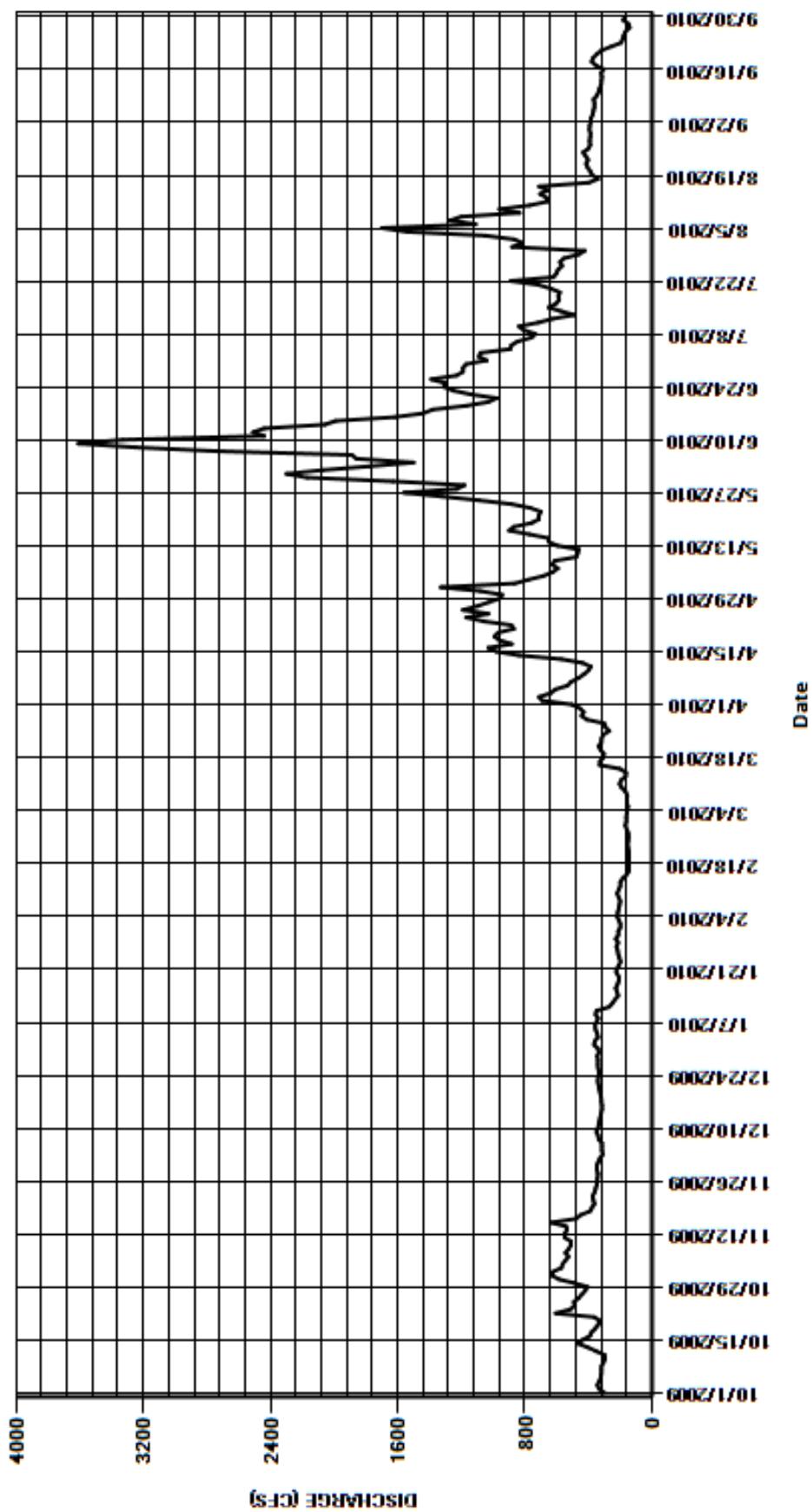
CAL YR	2009	TOTAL	217082	MEAN	595	MAX	2450	MIN	80	AC-FT	430600
WTR YR	2010	TOTAL	216003	MEAN	592	MAX	3610	MIN	141	AC-FT	428400

MAX DISCH: 4150 CFS AT 23:30 ON Jun. 09,2010 GH 15.29 FT. SHIFT -0.18 FT. (GH CORR. OF +0.07 FT APPLIED)

MAX GH: 15.29 FT. AT 23:30 ON Jun. 09,2010 (GH CORR. OF +0.07 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA
Water Year 2010

Location.-- Combined record from Arkansas River at Nepesta Rd. Bridge gage: Lat 38° 10' 44", Long 104° 8' 20", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005 and Oxford Farmers Ditch gage: Lat. 38°10'34",Long. 104° 08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005.

Drainage and Period of Record.-- 9,345 mi 2 .

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of mean daily discharge was obtained by the addition of Oxford Farmers Ditch mean daily flows to the corresponding mean daily flows in the Arkansas River at Nepesta Road Bridge. Mean daily discharge was estimated on the following days: November 17, 18, 24 – 27; December 1 – 31, 2009; January 1 – 31; February 1 – 17, 20 – 24, 2010. The peak unit value discharge for the year was 4280 cfs and occurred at 2330 June 9, 2010.

Special Computations.--

Remarks.-- Combined record is fair, except during periods of estimated flow, which should be considered poor. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road bridge below the diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the total Arkansas River flow is computed by combining the Oxford Ditch mean daily discharge with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Record developed by Div 2 Staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

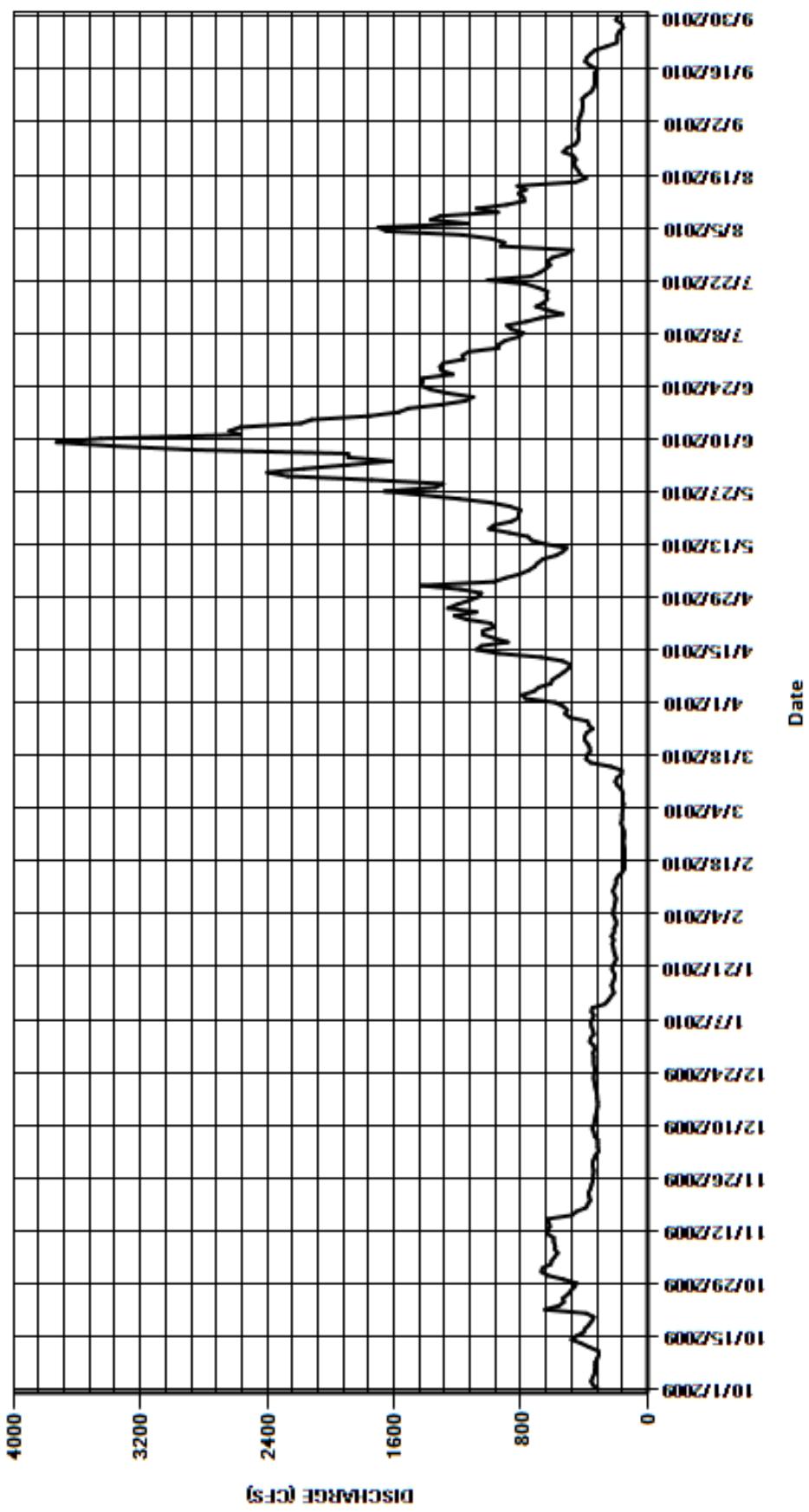
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	314	671	338	365	200	162	584	1180	2400	1160	904	438
2	346	664	328	360	200	162	770	1430	2170	1170	987	433
3	357	612	310	340	209	160	790	968	1890	1130	1170	431
4	347	605	315	345	220	159	717	900	1620	942	1650	420
5	336	586	315	355	215	152	688	809	1890	937	1700	414
6	334	568	315	359	210	159	611	753	1890	897	1130	410
7	332	586	335	350	205	160	603	715	2860	812	1370	409
8	331	585	340	340	200	156	565	694	3370	784	1310	415
9	319	593	350	355	210	167	531	662	3730	860	945	391
10	308	592	340	350	220	191	502	578	3450	889	1080	356
11	312	632	335	270	210	204	486	535	2570	766	889	342
12	367	634	330	250	200	194	539	511	2640	674	777	334
13	418	618	325	232	200	166	674	647	2570	536	784	334
14	481	623	320	213	185	164	940	733	2190	627	815	333
15	449	638	315	221	160	233	1080	755	2120	704	769	334
16	404	479	315	228	145	359	1050	873	1750	656	821	318
17	394	450	320	217	147	389	883	1000	1570	634	456	366
18	370	390	320	209	146	384	965	970	1510	641	389	394
19	352	378	325	209	145	363	1040	860	1300	632	426	385
20	341	362	330	224	145	366	1040	815	1150	692	438	361
21	388	370	335	224	146	379	967	815	1100	770	456	332
22	648	374	340	209	150	397	990	802	1260	1010	467	259
23	559	362	340	198	154	397	1140	870	1370	735	454	194
24	529	355	335	206	150	385	1220	989	1430	682	470	191
25	535	348	335	213	147	347	1080	1190	1420	644	533	191
26	505	345	340	217	150	371	1260	1420	1420	616	510	180
27	485	343	340	224	160	380	1200	1660	1230	632	457	155
28	463	341	340	213	168	490	1130	1340	1300	601	441	164
29	449	348	345	228	---	522	1070	1290	1310	515	434	200
30	532	349	335	213	---	508	1050	1740	1290	477	435	187
31	629	---	340	213	---	533	---	2270	---	929	441	---
TOTAL	12934	14801	10246	8150	4997	9159	26165	30774	57770	23754	23908	9671
MEAN	417	493	331	263	178	295	872	993	1926	766	771	322
AC-FT	25650	29360	20320	16170	9910	18170	51900	61040	114600	47120	47420	19180
MAX	648	671	350	365	220	533	1260	2270	3730	1170	1700	438
MIN	308	341	310	198	145	152	486	511	1100	477	389	155
CAL YR	2009	TOTAL	232298	MEAN	636	MAX	2570	MIN	80	AC-FT	460800	
WTR YR	2010	TOTAL	232329	MEAN	637	MAX	3730	MIN	145	AC-FT	460800	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
Water Year 2010

Location.--	Lat. $38^{\circ}07'33''$, Long. $103^{\circ}54'41''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at Catlin Canal gage, on right bank 2.2 mi downstream from diversion dam for Catlin Canal, 2.3 mi downstream from Apishapa River, and 6.0 mi east of Fowler.
Drainage and Period of Record.--	10,901 mi 2 . October 1964 to current year.
Equipment.--	Satellite-monitored data collection platform (Sutron 8210 DCP) with Sutron Constant Flow Bubbler (CFB) housed in an 8 ft x 8 ft shelter. This DCP also monitors the Catlin Canal's flume gage height and USGS water quality sensors. The primary reference gage is an outside staff gage which is attached to a concrete flood block that holds the bubbler orifice. A cableway approximately 2 miles upstream of the gage is normally used for high flow measurements. The cableway was not usable this water year.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 10,800 square miles. Basin characteristics include elevation differences from Mt. Elbert at $14,433 \pm$ ft to the gage at elevation $4,245 \pm$ ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 61 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 38 hours to reach the gage. Unregulated tributaries below Pueblo Reservoir that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River. The Apishapa River's confluence with the Arkansas River is approximately 2.4 miles above the gage. Numerous irrigation diversion points exist above the gage including Catlin Canal operations which sluice approximately 0.24 miles above the gage and also divert from the river approximately 2.25 miles above the gage. All of these factors influence streamflow at the gage. Mean annual precipitation for the basin is $17.09 \pm$ inches. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite transmitted CFB data, with DCP log backup. Record is complete and reliable, except for the following periods: December 5-27, 2009; January 7-11, February 9-11, 2010 when ice affected the recorded gage heights.
Datum Corrections.--	Levels were run on August 22, 2008 using BM#1 as the base. The outside staff gage was found to be 0.03 feet low. The outside staff gage was corrected.
Rating.--	A shifting sand channel is the control at all stages with heavily vegetated bank areas contributing to the flow during high gage heights of 9.5 feet and above. Rating curve ARKCACO11, dated June 26, 2003, was used for the entire water year. Fifteen discharge measurements (Nos. 1192-1206) were made throughout the water year covering a range in discharge from 31.3 to 591 cfs. High flow measurements were not made this water year due to the cableway being unusable. The measurements cover the range in stage except for lower flows that occurred October 6-7, 2009; March 15, 2010 ; and higher flows that occurred for numerous days throughout the water year since measurements from the cableway were not possible. The peak discharge of 3670 cfs occurred at 0530 June 10, 2010 at a gage height of 6.08 ft with a shift of -0.24 ft.
Discharge.--	Shifting control method was used to compute discharge for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were prorated by time from the beginning of the water year to the start of the ascending limb of the peak runoff on March 26, 2010 at 12:22 hours. Two variable shift curves (SC01 and SC02) were used to define the peak event from March 26, 2010 at 13:00 hours through July 19, 2010 at 13:47 hours - encompassing measurement numbers 1198-1201. Both shift curves were supplemented with data from water years 2008 and 2009 at higher stages to help define the upper end of the variable shift curve since high water measurements were not obtainable this water year. Shifts were prorated from the end of the descending limb on July 19, 2010 at 14:00 hours to the start of a minor peak event which occurred on August 5, 2010 at 20:45 hours. Previous water year 2008 and 2009 data was again examined to help determine the appropriate shift for the event. Shifts were again prorated from the end of the event on August 19, 2010 to the end of the water year. Measurement number 1201 was discounted 7% for smoothing purpose in the shifting control methodology.
Special Computations.--	The potential for ice-affected gage heights were analyzed using on-site water temperature data, Rocky Ford NOAA max-min air temperature data, gage height time series traces, field measurement notes and downstream hydrographs. Discharge estimated by using ARKCACO adjacent ice free data and downstream hydrographs from ARKROCCO and FLSCANCO. Shift curve data was supplemented with data from water years 2008 and 2009 to help define shifts at higher gage heights.
Remarks.--	Record is good except the ice effected periods which are estimated and poor. Gage operated by Adam Adame and record developed by Charlie DiDomenico.
Recommendations.--	High water measurements should resume from the cableway in WY2011. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. Measurement should be made at the established frequency for sand channel gages. Since this record is effected by sluice operations on the Catlin Canal, it is recommended that more measurements be taken at the sluice to verify the sluice structure rating CATSLUCO02. C

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER

RATING TABLE-- ARKCACCO11 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

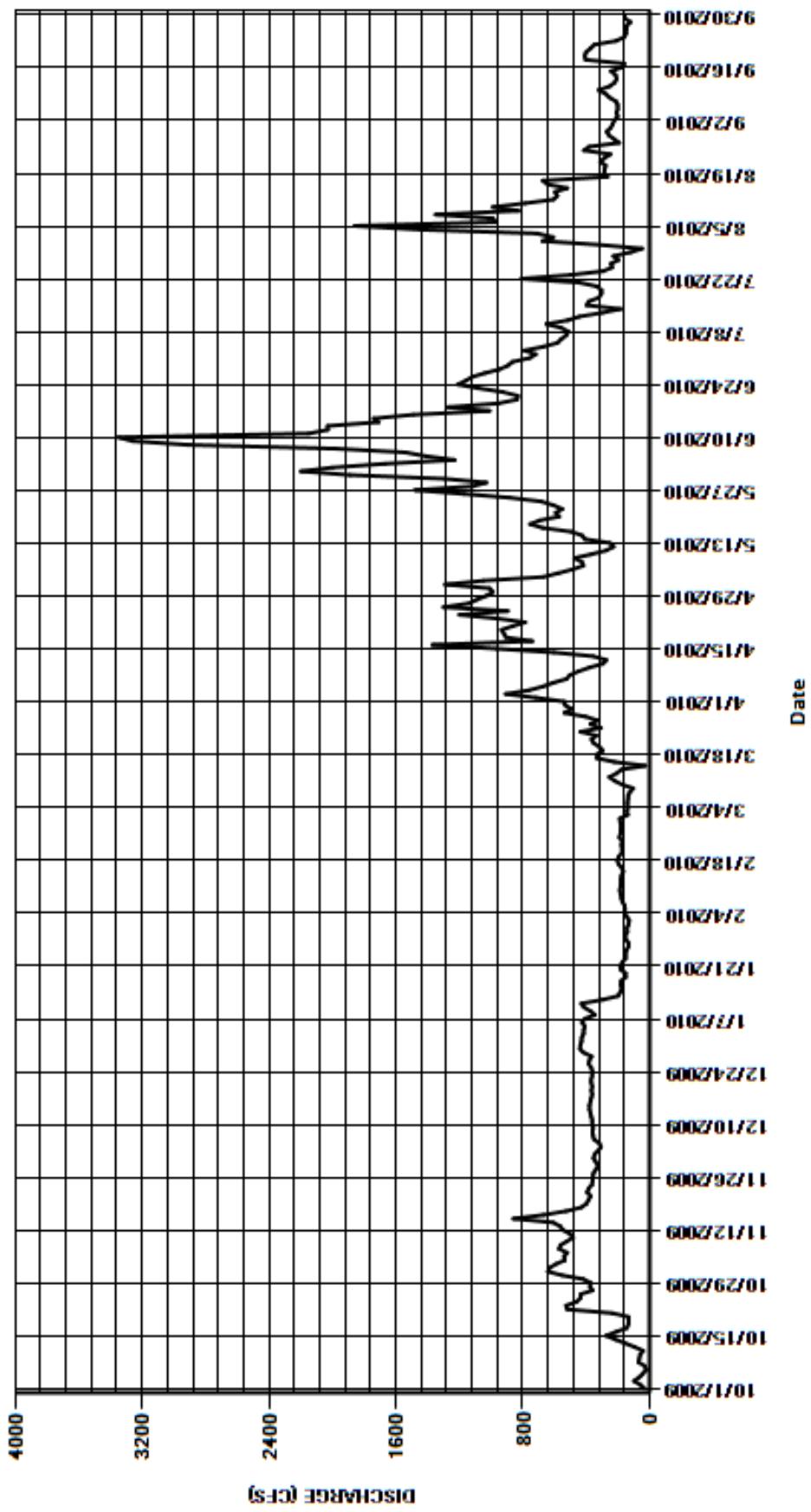
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	642	354	430	133	189	539	1010	2200	757	677	233
2	59	631	348	428	130	139	717	1290	2000	718	607	223
3	99	591	326	417	143	143	908	1050	1670	789	711	202
4	66	535	307	416	160	138	761	672	1230	670	1440	209
5	42	540	318	409	156	141	672	577	1410	582	1860	201
6	22	520	351	427	159	138	606	487	1540	558	970	201
7	31	571	357	408	173	136	524	418	1980	527	990	213
8	72	563	362	345	179	126	504	428	2910	513	1350	253
9	65	522	357	374	184	104	449	476	3260	558	827	278
10	61	483	362	414	188	173	381	368	3350	652	989	322
11	41	503	362	431	184	221	295	275	2150	517	785	251
12	94	547	368	298	181	255	273	228	2030	441	606	220
13	154	565	374	199	183	207	356	251	2030	299	583	208
14	215	609	380	186	177	177	603	408	1710	183	597	216
15	275	859	380	175	166	28	964	427	1740	398	520	244
16	212	671	374	184	177	222	1370	496	1490	384	643	174
17	145	528	368	180	197	333	740	673	1010	320	674	160
18	135	431	362	151	204	332	906	754	1270	305	266	404
19	132	398	368	152	194	296	920	693	952	304	287	409
20	134	386	362	183	173	317	934	570	837	334	284	402
21	237	372	368	186	174	354	862	593	832	446	278	374
22	520	394	368	171	178	366	785	551	926	809	312	350
23	527	385	362	151	173	336	960	607	1080	500	285	212
24	461	364	362	152	191	438	1200	683	1210	294	247	161
25	437	361	368	149	185	307	895	883	1160	237	415	149
26	435	358	385	135	184	375	1300	1170	1120	244	382	147
27	360	355	380	133	180	327	1140	1480	1040	196	193	146
28	378	340	366	151	185	403	1090	1120	948	229	225	121
29	372	324	417	154	---	538	1030	1030	894	122	257	157
30	419	339	440	141	---	492	989	1290	865	48	271	160
31	551	---	437	144	---	532	---	1890	---	316	245	---
TOTAL	6783	14687	11393	7874	4891	8283	23673	22848	46844	13250	18776	7000
MEAN	219	490	368	254	175	267	789	737	1561	427	606	233
AC-FT	13450	29130	22600	15620	9700	16430	46960	45320	92920	26280	37240	13880
MAX	551	859	440	431	204	538	1370	1890	3350	809	1860	409
MIN	22	324	307	133	130	28	273	228	832	48	193	121
CAL YR	2009	TOTAL	174139	MEAN	477	MAX	2030	MIN	22	AC-FT	345400	
WTR YR	2010	TOTAL	186302	MEAN	510	MAX	3350	MIN	22	AC-FT	369500	

MAX DISCH: 3670 CFS AT 05:30 ON Jun. 10,2010 GH 6.08 FT. SHIFT -0.24 FT.

MAX GH: 6.08 FT. AT 05:30 ON Jun. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
Water Year 2010

Location.-- Lat. 38°07'33", Long. 103°54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at river gage.

Drainage and Period of Record.-- N/A

Equipment.-- Float-activated graphic water-stage recorder and shaft encoder in 8 ft x 8 ft shelter with well (with equipment for Arkansas River below Catlin Dam near Fowler CO river gage). Shaft encoder is connected to satellite-monitored data collection platform (DCP) used for river gage. Fifteen-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume.

Hydrologic Conditions.-- The Catlin Canal diverts water from the Arkansas River just downstream from the confluence of the Apishapa River. The Catlin Canal Company owns a variety of both native and transmountain water rights and thus the hydrologic characteristics of the basins are highly variable. The influence of urbanization provides the largest affect to the runoff regime.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage.

Datum Corrections.-- Levels were last run 8 Oct 2003. No corrections needed. The 2003 level survey did identify the flume floor is not level and the floor at the upstream right corner was found to be 0.05 feet higher than the floor at the intakes/staff gage.

Rating.-- A standard 15-ft Parshall Flume table was used all year. One discharge measurement (No. 19 – June 9, 2010) was made this year. The peak flow of 325 cfs occurred at 0830 on June 5, 2010 at a gage height of 2.94 ft with a shift of 0.00 ft. The peak exceeded the stage of measurement No. 19 by 0.01 feet.

Discharge.-- Measurement number 19 was discounted 2.2 percent to a 0.00 ft shift. Adjusting measurements to provide for a zero shift has been the historical practice at this structure. Discharge record was computed by direct application of the standard rating to the gage height record.

Special Computations.-- No special computations were necessary this water year.

Remarks.-- The record is good. Station maintained and record developed by Adam Adame.

Recommendations.-- A levels survey and flume inspection should be performed during the non irrigation season to confirm the floor elevations and the position of the staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER

RATING TABLE--

STD15FTPf USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	181	122	0	0	0	0	120	248	284	253	250	261
2	174	121	0	0	0	0	120	247	292	253	247	253
3	170	121	0	0	0	0	120	248	296	252	247	256
4	170	121	0	0	0	0	119	249	303	252	248	238
5	170	122	0	0	0	0	143	249	315	254	195	205
6	170	122	0	0	0	0	153	251	319	253	199	189
7	171	123	0	0	0	0	153	248	322	254	201	171
8	171	122	0	0	0	0	153	250	322	253	201	171
9	170	121	0	0	0	0	173	248	322	255	200	148
10	177	121	0	0	0	0	183	248	322	252	197	2.4
11	181	122	0	0	0	0	209	247	307	250	227	1.6
12	183	122	0	0	0	0	224	247	301	248	245	1.4
13	183	122	0	0	0	0	249	247	299	248	247	1.4
14	183	93	0	0	0	0	249	245	285	248	246	1.3
15	182	0	0	0	0	137	248	245	251	249	246	2.9
16	181	0	0	0	0	146	246	246	251	246	248	31
17	182	0	0	0	0	148	245	245	252	246	246	32
18	181	0	0	0	0	148	246	243	250	247	247	18
19	181	0	0	0	0	149	246	245	250	248	247	1.2
20	182	0	0	0	0	148	247	244	257	233	246	1.2
21	173	0	0	0	0	149	246	245	253	247	247	1.3
22	164	0	0	0	0	149	246	244	249	250	247	1.4
23	162	0	0	0	0	149	247	245	248	249	247	1.3
24	162	0	0	0	0	131	245	245	251	250	248	1.3
25	163	0	0	0	0	116	243	246	249	250	249	1.5
26	162	0	0	0	0	118	245	244	250	250	247	1.6
27	162	0	0	0	0	115	247	246	250	250	249	1.7
28	148	0	0	0	0	118	248	247	249	250	236	1.6
29	127	0	0	0	---	121	250	247	250	248	208	5.9
30	120	0	0	0	---	120	249	261	252	248	204	30
31	121	---	0	0	---	120	---	272	---	251	227	---
TOTAL	5207	1675.00	0.00	0.00	0.00	2282.00	6312	7682	8301	7737	7239	2034.0
MEAN	168	55.8	0	0	0	73.6	210	248	277	250	234	67.8
AC-FT	10330	3320	0	0	0	4530	12520	15240	16470	15350	14360	4030
MAX	183	123	0	0	0	149	250	272	322	255	250	261
MIN	120	0	0	0	0	0	119	243	248	233	195	1.2

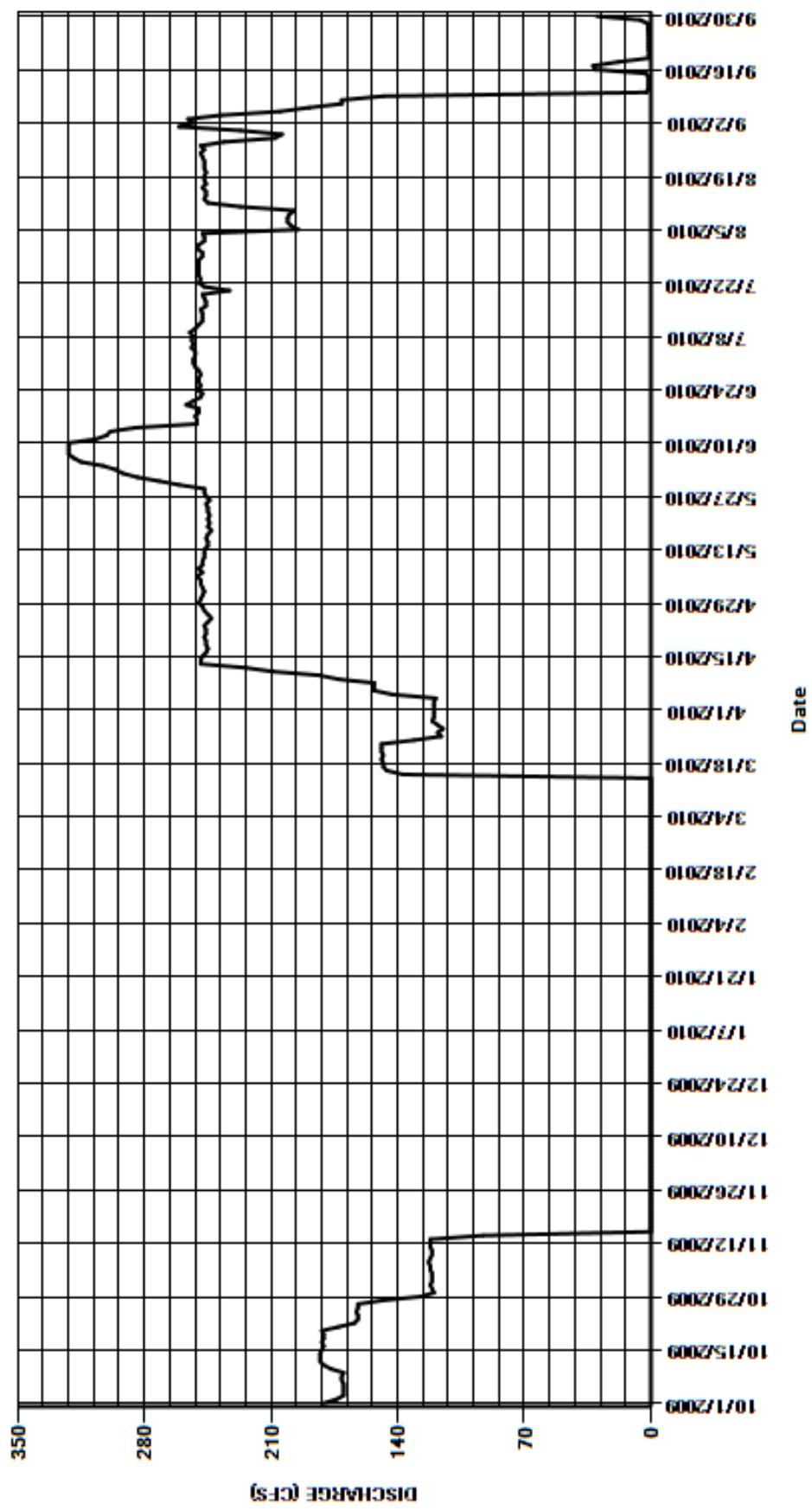
CAL YR	2009	TOTAL	54066.50	MEAN	148	MAX	309	MIN	0	AC-FT	107200
WTR YR	2010	TOTAL	48469.00	MEAN	133	MAX	322	MIN	0	AC-FT	96140

MAX DISCH: 325 CFS AT 08:15 ON Jun. 05,2010 GH 2.94 FT. SHIFT 0 FT.

MAX GH: 2.94 FT. AT 08:15 ON Jun. 05,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
Water Year 2010

Location.-- Combined record from Arkansas River below Catlin Dam and Catlin Canal gages both located at Lat 38°07'33", long 103° 54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County.

Drainage and Period of Record.-- 10,901 mi².

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of Catlin Canal daily flows to the corresponding daily flows in the Arkansas River below Catlin Dam. Mean daily discharge was estimated on the following days: December 5-27, 2009; January 7-11, February 9-11, 2010. The peak unit value discharge for the year was 3990 cfs at 0530 Hrs on June 10, 2010.

Special Computations.--

Remarks.-- Combined record is good, except during periods of estimated flow, which should be considered poor. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

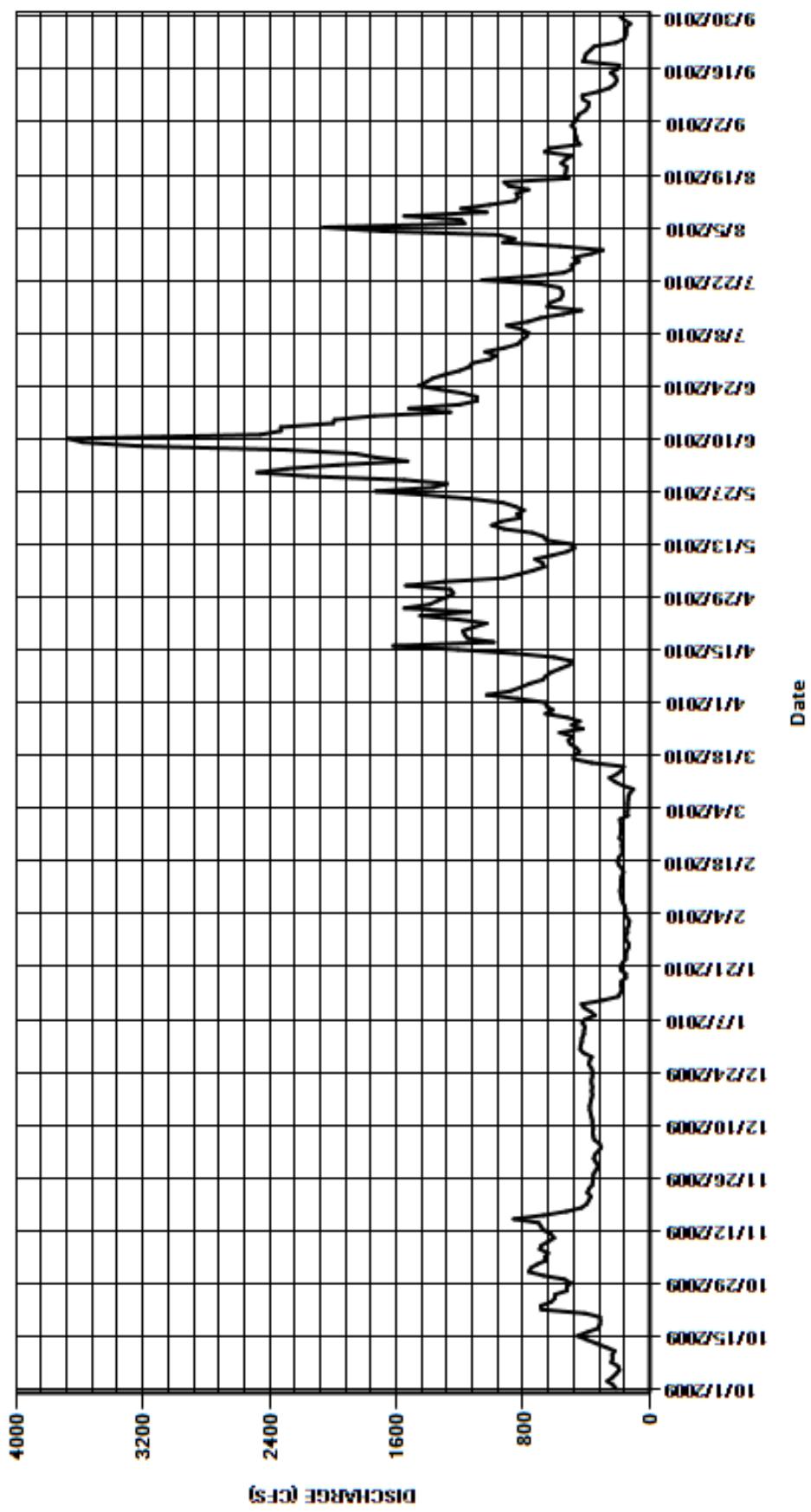
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	213	764	354	430	133	189	659	1260	2480	1010	927	494
2	233	752	348	428	130	139	837	1540	2290	971	854	476
3	269	712	326	417	143	143	1030	1300	1970	1040	958	458
4	236	656	307	416	160	138	880	921	1530	922	1690	447
5	212	662	318	409	156	141	815	826	1730	836	2060	406
6	192	642	351	427	159	138	759	738	1860	811	1170	390
7	202	694	357	408	173	136	677	666	2300	781	1190	384
8	243	685	362	345	179	126	657	678	3230	766	1550	424
9	235	643	357	374	184	104	622	724	3580	813	1030	426
10	238	604	362	414	188	173	564	616	3670	904	1190	324
11	222	625	362	431	184	221	504	522	2460	767	1010	253
12	277	669	368	298	181	255	497	475	2330	689	851	221
13	337	687	374	199	183	207	605	498	2330	547	830	209
14	398	702	380	186	177	177	852	653	2000	431	843	217
15	457	859	380	175	166	165	1210	672	1990	647	766	247
16	393	671	374	184	177	368	1620	742	1740	630	891	205
17	327	528	368	180	197	481	985	918	1260	566	920	192
18	316	431	362	151	204	480	1150	997	1520	552	513	422
19	313	398	368	152	194	445	1170	938	1200	552	534	410
20	316	386	362	183	173	465	1180	814	1090	567	530	403
21	410	372	368	186	174	503	1110	838	1090	693	525	375
22	684	394	368	171	178	515	1030	795	1180	1060	559	351
23	689	385	362	151	173	485	1210	852	1330	749	532	213
24	623	364	362	152	191	569	1450	928	1460	544	495	162
25	600	361	368	149	185	423	1140	1130	1410	487	664	151
26	597	358	385	135	184	493	1550	1410	1370	494	629	149
27	522	355	380	133	180	442	1390	1730	1290	446	442	148
28	526	340	366	151	185	521	1340	1370	1200	479	461	123
29	499	324	417	154	---	659	1280	1280	1140	370	465	163
30	539	339	440	141	---	612	1240	1550	1120	296	475	190
31	672	---	437	144	---	652	---	2160	---	567	472	---
TOTAL	11990	16362	11393	7874	4891	10565	30013	30541	55150	20987	26026	9033
MEAN	387	545	368	254	175	341	1000	985	1838	677	840	301
AC-FT	23780	32450	22600	15620	9700	20960	59530	60580	109400	41630	51620	17920
MAX	689	859	440	431	204	659	1620	2160	3670	1060	2060	494
MIN	192	324	307	133	130	104	497	475	1090	296	442	123
CAL YR	2009	TOTAL	228192	MEAN	625	MAX	2230	MIN	55	AC-FT	452600	
WTR YR	2010	TOTAL	234825	MEAN	643	MAX	3670	MIN	104	AC-FT	465800	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER NEAR ROCKY FORD
Water Year 2010

Location.--	Lat. 38°03'52", Long. 103°41'24" in SE ¼, NW ¼, Sec. 9, T23S, R56W, Hydrologic Unit 11020005, Otero County, on right bank of Arkansas River, approximately 250 feet upstream from State Highway 266, and approximately 1.6 miles NE of Rocky Ford, Colorado.
Drainage and Period of Record.--	11,438 sq. mi. Gage established October 8, 1992.
Equipment.--	Sutron 8210 DCP with a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 4 ft steel gage shelter with a tipping bucket precipitation gage. The CFB orifice line terminates in the channel on the streamside of a concrete floodblock situated on the right edge of water below the shelter. The primary reference gage is the top of an angle iron installed on a floodblock with a drop tape reference point. On April 16, 2010 the Sutron 8210 DCP was replaced with a Sutron Satlink2. No other changes.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 11,300 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 4,131 ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 79 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 42 hours to reach the gage. Unregulated tributaries that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River. Numerous irrigation diversion points exist above the gage. All of these factors influence steamflow at the gage. Mean annual precipitation for the basin is 16.87± inches. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite transmitted CFB data, with DCP log backup. Record is complete and reliable, except for the following periods: Dec 9-10, 2009 and Feb 10, 15-16, 2010, when ice affected the stage-discharge relationship; and April 15-16, 2010, when both satellite data and backup data from the DCP log were missing. Satellite data were missing for several hours on each of October 1-9, 11, November 9, 2009; February 25, March 22, 26, April 2, 6, 10, 13-14, June 19-20, July 2, and August 18-19, 2010. Data replaced with DCP log data without loss of accuracy.
Datum Corrections.--	Levels were last run to the wire weight gage on Sep. 25, 2008 using BM#1 as the base. No datum corrections were taken as a result of levels. The elevation of the tapedown RP on the flood block (7.421 ft) was also established on that date. The wire weight gage was recommended to no longer be used on that date as the water surface measured by the wire weight is different than at the flood block/orifice location.
Rating.--	The control is a shifting sand channel with earthen banks at low to medium flows. Rating No. 2 dated Oct. 1, 2003 was used the entire water year. Eighteen discharge measurements (Nos. 359-376) were made this water year, ranging in discharge and stage from 30.4 cfs (1.26 ft) to 2900 cfs (4.45 ft). WY2010 measurements covered the range in stage experienced. The peak instantaneous flow of 2940 cfs occurred at 1300 June 10, 2010 at a gage height of 4.47 ft with a shift of -0.22 ft. It exceeded the stage of measurement No. 368, made June 10, 2010, by 0.02 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were prorated by time from the beginning of the water year to the start of the ascending limb of the peak runoff on April 26, 2010 at 13:34 hrs. A single variable shift curve (ARKROCCOSC01) was used to define the peak flow period from April 26, 2010 at 14:00 hrs through Aug 12, 2010 at 11:34 hrs - encompassing measurement numbers 365-373. Shifts were again prorated by time from Aug 12 at 12:00 hrs to the end of the water year. Measurements show raw shifts ranging from -0.22 ft to +0.34 ft. All measurements were given full weight, except Nos. 366, 367, 369, and 371-373, which were discounted from -6% to +8% for smoothing purposes.
Special Computations.--	The potential for ice-affected gage heights was analyzed using NOAA air temperature data from the Rocky Ford 2SE approximately 2.2 miles away from the gage along with observations made during field measurements. Discharges on ice affected days and days of missing data were estimated using good record before and after the affected periods and by comparison to upstream and downstream hydrographs using the Arkansas River below Catlin Dam and Arkansas River at La Junta mean daily flows.
Remarks.--	Record is good for the entire water year, except for periods of ice affect and periods of missing record, which were estimated and are considered poor. Station maintained by Adam Adame and record developed by Charlie DiDomenico.
Recommendations.--	Levels need to be run in WY2011. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. A site visit log should be maintained at the gage throughout the water year and measurement should be made at the established frequency for sand channel gages.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER NEAR ROCKY FORD

RATING TABLE--

ARKROCCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

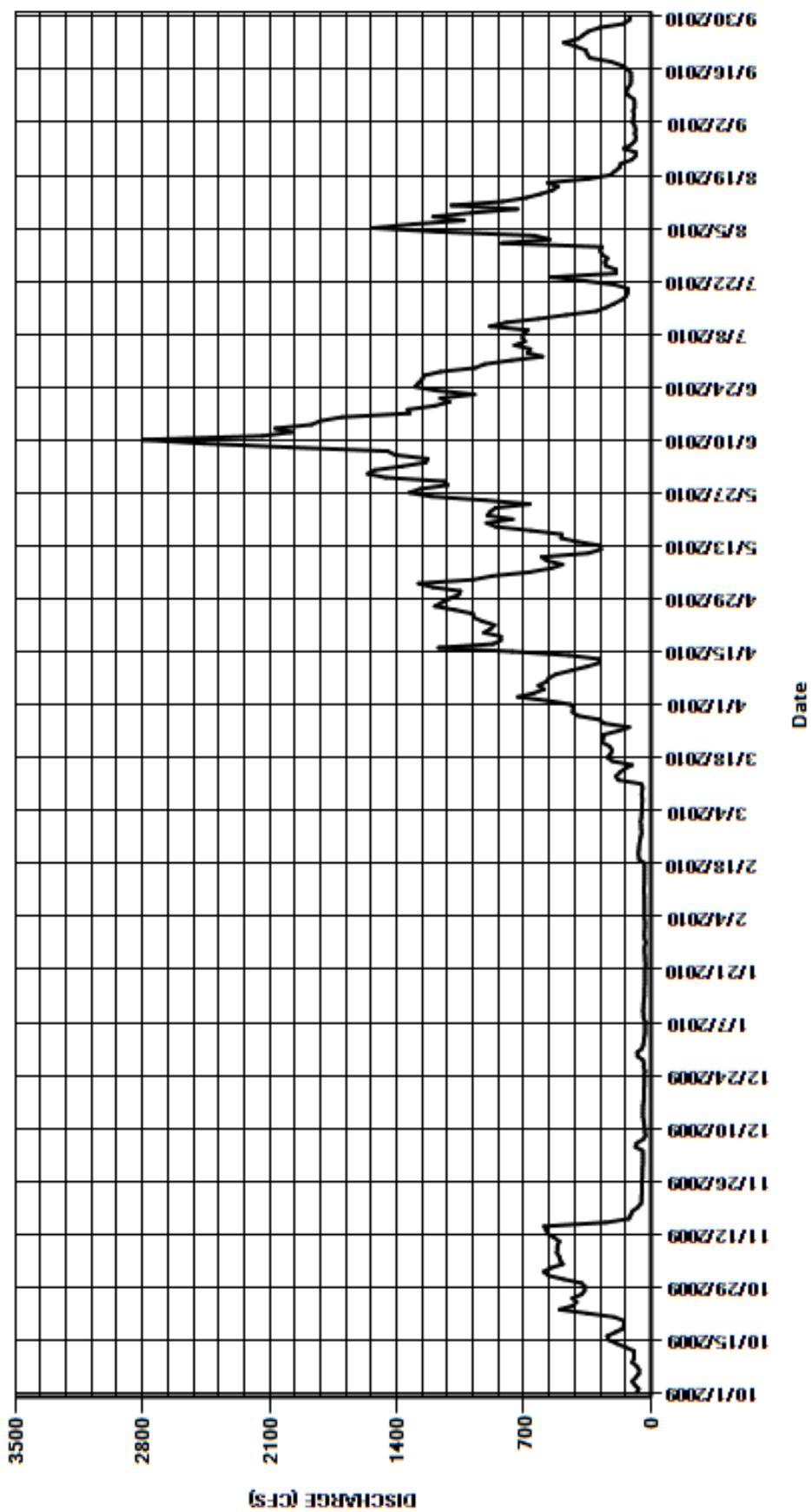
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	81	565	45	43	34	58	442	1050	1560	769	822	90
2	68	592	45	40	33	54	570	1200	1520	598	558	102
3	89	552	45	37	35	52	733	1280	1370	681	644	97
4	104	486	46	33	37	51	645	980	1240	665	1170	94
5	85	500	86	32	36	50	589	873	1230	751	1530	99
6	67	506	79	33	36	49	620	668	1410	694	1310	90
7	65	519	43	31	36	48	577	552	1450	708	1030	91
8	79	516	31	41	37	52	563	487	1990	705	1200	93
9	104	515	34	42	36	50	523	572	2460	678	989	123
10	95	505	36	44	38	46	437	603	2800	888	736	138
11	94	532	38	42	39	54	354	346	2140	797	1100	128
12	93	569	41	41	38	179	285	276	1980	620	817	113
13	140	577	45	39	37	194	285	280	2070	468	688	111
14	189	589	45	36	36	173	452	405	1870	302	609	111
15	235	250	44	35	36	144	764	495	1820	248	543	111
16	241	123	44	36	36	104	1170	492	1700	203	513	130
17	196	112	41	34	35	213	870	662	1330	162	568	163
18	153	102	39	34	36	240	827	854	1340	137	344	222
19	150	74	40	34	66	222	827	905	1190	128	224	338
20	149	55	40	34	68	214	920	762	1110	129	200	352
21	202	53	37	34	69	231	884	901	1160	201	174	359
22	353	52	37	31	66	271	861	885	972	361	167	412
23	504	50	37	32	65	264	929	856	1180	549	108	481
24	429	51	38	32	61	263	978	668	1300	193	86	403
25	410	51	33	35	57	179	981	911	1280	193	83	375
26	433	50	41	35	52	120	1080	1210	1260	250	151	346
27	382	48	40	35	54	259	1190	1330	1250	255	111	283
28	366	48	45	29	54	284	1150	1270	1160	240	89	151
29	363	47	75	35	---	403	1110	1120	969	270	83	120
30	383	46	76	37	---	433	1060	1140	917	281	90	115
31	482	---	50	36	---	426	---	1460	---	270	85	---
TOTAL	6784	8735	1416	1112	1263	5380	22676	25493	45028	13394	16822	5841
MEAN	219	291	45.7	35.9	45.1	174	756	822	1501	432	543	195
AC-FT	13460	17330	2810	2210	2510	10670	44980	50570	89310	26570	33370	11590
MAX	504	592	86	44	69	433	1190	1460	2800	888	1530	481
MIN	65	46	31	29	33	46	285	276	917	128	83	90

CAL YR	2009	TOTAL	147365	MEAN	404	MAX	2150	MIN	23	AC-FT	292300
WTR YR	2010	TOTAL	153944	MEAN	422	MAX	2800	MIN	29	AC-FT	305300

MAX DISCH: 2940 CFS AT 13:00 ON Jun. 10,2010 GH 4.47 FT. SHIFT -0.22 FT.
 MAX GH: 4.47 FT. AT 13:00 ON Jun. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER NEAR ROCKY FORD
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07122400 CROOKED ARROYO NEAR SWINK, CO
Water Year 2010

Location.--	Lat. 37°58'56", Long. 103°35'52", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T.24 S., R.55 W., Otero County, on right bank 54 ft. downstream from bridge on State Highway 10, 2.0 mi. upstream from mouth, and 2.8 mi. southeast of Swink.
Drainage and Period of Record.--	108 mi ² .
Equipment.--	High data rate Sutron 8210 DCP and Sutron Constant Flow Bubbler (CFB) installed in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage in the channel. No changes were made this water year.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 108 square miles. Basin characteristics include land uses primarily of rangeland with the lower portion of the basin used as irrigated agricultural land. Surface cover in the rangeland area is primarily native grasses and weeds. Streamflow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from short duration summer thunderstorms and snowmelt runoff contributing in the minor. Mean annual precipitation for the basin is 13.42± inches. Flows at the gaging station can be affected by minor irrigation diversions from the channel and highly variable irrigation return flows from the Catlin Canal. Flows can also be regulated by two reservoirs in the upstream basin as well as by beaver dams. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored constant flow bubbler data, with DCP log backup. Record is complete and reliable, except for the following periods: March 5-April 29, 2010, when the gage height was affected by a downstream beaver dam. The following periods had missing satellite data: April 22-23, August 6-9, 25, 2010. Missing data were filled in from the DCP log without loss of accuracy. Primary stage sensor calibration to the reference gage is supported by 14 visits made this water year. Based on these visits, the following corrections were applied to the gage height record: July 28 – August 8, 2010, prorated from 0.00 to +0.05 ft correction.
Datum Corrections.--	Levels were last run August 22, 2008. No corrections were made.
Rating.--	The control is a sand, gravel, clay, and mud channel with earthen banks. Bank vegetation of variable density affects medium to high flows considerably. During low flow periods in the winter months considerable moss/algae growth appears in the channel bottom affecting the stage-discharge relationship. During WY2010, beaver activity downstream of the gage began affecting the stage-discharge relationship. Prior to April 28, 2010 when the beaver dam was removed, it appeared that the beaver dam may have created backwater at the gage as indicated by large negative shifts. Rating No. 7, was used the entire water year. It is well defined to approximately 100 cfs. Fourteen discharge measurements (Nos. 263-276) were made this water year ranging in discharge from 3.47 to 25.8 cfs. They cover the range in stage experienced except for the lower daily flows on September 12-17, 21-30, 2010, and higher daily flows on October 11, 21-30, 2009; April 23-26, May 19-24, June 7, 12-21, July 11-12, 21-27 and August 1, 4-5, 7-8, 12-13, 16, 2010. The peak discharge is undetermined due to uncertainty of the backwater effect from the downstream beaver dam on the stage-discharge relationship. The apparent peak gage height of 3.86 ft at 1015 on April 25, 2010 was higher than the beaver affected gage height from measurement No. 267, made April 26, 2010, by 0.26 feet in stage.
Discharge.--	Shifting control method used all year. Shifts were applied directly and given full weight. Shifts were distributed by time proration from the start of the water year to March 5, 2010 when it appears that gage heights began to be affected by the beaver dam. A variable stage-shift curve was utilized from March 5 - April 29, 2010 when the beaver dam was removed and a streamflow measurement was made. Shifts were again distributed by time proration from April 29, 2010 to the end of the water year.
Special Computations.--	Temperature and precipitation data from the La Junta 1S NOAA gage was utilized to analyze potential ice affect and unusual spikes. Diversions from the Catlin Canal were compared to CANSWKCO discharges during the beaver dam affected periods to assist in estimated discharge values.
Remarks.--	Record is good for the entire water year except for the period of backwater cause by a downstream beaver dam, which is estimated and considered poor. Station maintained by Adam Adame and record developed by Charlie DiDomenico.
Recommendations.--	All chisled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. Rating Curve #7 needs to be updated to correct a negative shift trend.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07122400 CROOKED ARROYO NEAR SWINK, CO

RATING TABLE--

CANSWKCO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

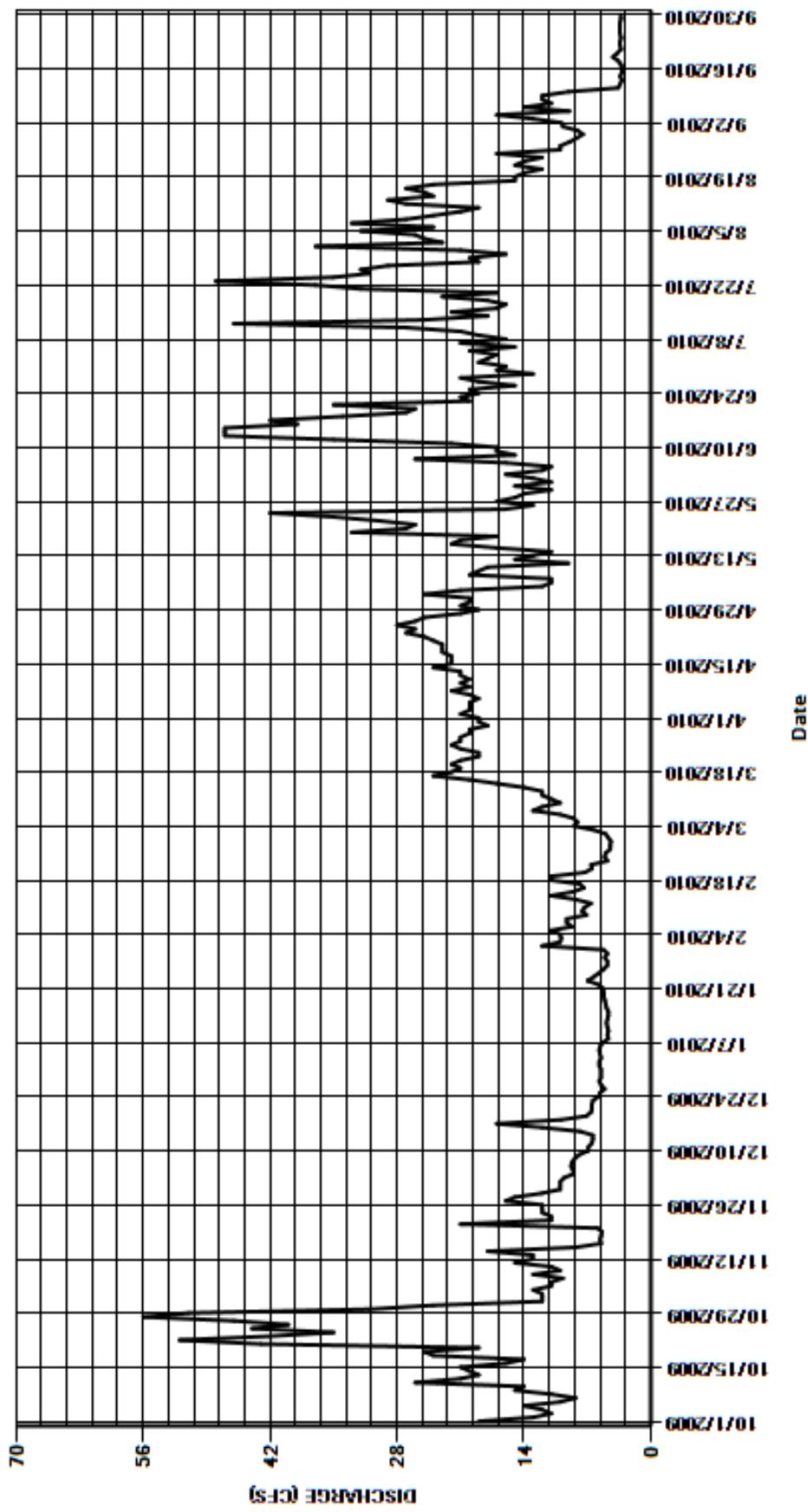
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	12	10	5.7	12	4.7	19	20	11	16	37	9.7
2	13	12	10	5.7	10	5	21	20	13	19	23	9.9
3	11	12	9.6	5.5	9.9	6.3	20	25	16	18	25	13
4	12	13	8.5	5.6	10	8.5	20	21	12	17	26	17
5	14	11	8.6	5.7	11	8.1	20	12	11	20	32	9
6	10	11	8.8	5.6	8.7	8.5	19	11	16	15	24	14
7	8.3	9.7	8.7	5.3	9.3	10	20	11	26	21	33	11
8	11	13	8.4	4.7	9.3	13	22	20	15	16	27	12
9	15	10	7.9	4.8	7.1	12	20	19	17	19	24	12
10	14	11	6.9	4.7	7.6	10	21	18	17	21	21	9.1
11	26	15	6.9	4.8	7.3	11	20	9.1	22	27	19	3.6
12	21	13	6.5	4.9	6.6	12	21	15	35	46	27	3.4
13	19	13	6.4	4.8	8.3	12	21	13	47	25	29	3.2
14	20	18	6.4	4.7	11	14	24	11	47	18	24	3.4
15	21	8.3	7.8	4.7	8.6	17	22	17	47	22	25	3.2
16	16	5.5	12	4.9	7.4	20	22	22	39	17	27	3.2
17	14	5.6	17	5	7.8	24	22	21	42	16	24	3.3
18	24	5.5	9.9	5.1	11	22	23	17	34	18	15	3.6
19	25	5.4	7.1	5.2	11	21	23	33	27	23	15	4.2
20	19	5.9	6.6	5.2	7.3	22	23	27	26	17	14	3.7
21	43	21	6.5	5.3	6.5	21	24	26	35	32	12	3.3
22	52	11	6.5	5.8	6.6	19	25	30	20	37	15	3.4
23	42	11	6.4	7	4.8	19	27	35	21	48	14	3.4
24	35	12	5.8	6.3	5.1	21	26	42	19	35	12	3.3
25	44	12	5.6	5.7	5	22	28	16	20	31	17	3.4
26	40	12	5.1	5.2	4.5	21	26	13	15	32	10	3.4
27	46	16	5.5	4.8	4.5	21	25	17	19	29	10	3.4
28	56	15	5.7	4.8	4.4	20	21	15	21	19	9	3.4
29	51	12	5.5	5.1	---	20	19	14	13	20	8.2	3.3
30	31	10	5.5	4.8	---	18	21	11	17	16	7.5	3.3
31	24	---	5.5	5.2	---	19	---	15	---	21	8.1	---
TOTAL	796.3	341.9	237.6	162.6	222.6	482.1	665	596.1	720	731	613.8	185.1
MEAN	25.7	11.4	7.66	5.25	7.95	15.6	22.2	19.2	24	23.6	19.8	6.17
AC-FT	1580	678	471	323	442	956	1320	1180	1430	1450	1220	367
MAX	56	21	17	7	12	24	28	42	47	48	37	17
MIN	8.3	5.4	5.1	4.7	4.4	4.7	19	9.1	11	15	7.5	3.2
CAL YR	2009	TOTAL	5382.8	MEAN	14.7	MAX	56	MIN	3.1	AC-FT	10680	
WTR YR	2010	TOTAL	5754.1	MEAN	15.8	MAX	56	MIN	3.2	AC-FT	11410	

MAX DISCH: (not determined)

MAX GH: 3.86 FT. AT 10:15 ON Apr. 25,2010 (backwater affected by beaver dam)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07122400 CROOKED ARROYO NEAR SWINK CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07123000 ARKANSAS RIVER AT LA JUNTA
Water Year 2010

Location.-- Lat. 37°59'26", Long. 103°31'55", in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, T.24 S., R.55 W., Otero County, Hydrologic Unit 11020005, on right bank at upstream side of bridge on State Highway 109 in La Junta, 450 ft upstream from King Arroyo.

Drainage and Period of Record.-- 12,210 mi². Staff gage originally established by USGS in 1889, with sporadic data and various locations. Water stage recorder in use since Oct. 1933 at several locations also. Gage site in continuous use since then.

Equipment.-- Satellite-monitored data collection platform (high data rate Sutron 8210 DCP) and Sutron Constant Flow Bubbler in 4 ft x 4 ft steel shelter. A wire-weight gage on the Hwy 109 Bridge serves as the primary reference gage. An air temperature sensor was installed on March 17, 2010. A radar water level sensor was installed on May 25, 2010. The data from that sensor were not used for this streamflow record. No other changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable except for Dec 6-12, 24-31, 2009, Jan 8-24, 28-31, 2009, when ice affected the stage-discharge relationship. There were six missing or bad 15-minute CFB gage height values on May 25, when the radar sensor was installed. The missing values were replaced using surrounding good values and trend in gage height change without loss of accuracy.

Datum Corrections.-- Levels were last run on Oct. 4, 2007. No corrections were made.

Rating.-- A shifting sand channel is the primary control at low stages with bridge piers, abutments, heavily vegetated banks and islands contributing at medium flows and above. At high flows (flooding stage) river will flow out of bank on the north side approximately 150 to 200 feet upstream of the gage. Rating No. 42, in use since October 1, 2008, was used during the entire water year. Twenty-one discharge measurements (Nos. 1143-1163), ranging in discharge from 57.3 to 1910 cfs, were made during the water year. They cover the range in stage experienced except for the lower daily flows of Oct 7, 2009, Mar 16, 18-21, 23, Apr 8-13, 15, Sep 6-17, 29, 30, 2010. The peak flow of 1910 cfs occurred at 1745 on Jun 10, 2010 at a gage-height of 10.05 feet with a shift of 0.72 feet. It exceeded the stage of high flow measurement No. 1155 by 0.11ft.

Discharge.-- Shifting channel control method used all year. Shifts were applied as defined by measurements and distributed by time and stage. Shifts were distributed by time (with consideration of high flow events) from 0000 Oct 1 2009 through 1200 April 21, 2010. Three variable stage shift relationships were used the remainder of the water year: ARKLAJCOSC10_1 (based on Msmts 1151-1155) was used from 1300 Apr 21 to the peak at 1745 Jun 10; ARKLAJCOSC10_2 (based on Msmts 1155-1162) was used from 1800 Jun 10 to 1230 Sep 2; ARKLAJCOSC10_3 (based on Msmts 1162-1165) was used from 1300 Sep 2 to the end of the water year. Water year 2010 measurements showed shifts ranging from -0.33 to +0.72 ft. Measurement Nos. 1151-1154, and 1158-1162 were discounted from -6% to +6% to fit the variable stage shift relationships.

Special Computations.-- Flows were estimated on ice affected days using good partial day record and good record before and after periods of ice effect. A hydrograph was used and daily average flows were compared to upstream gage: Arkansas River near Rocky Ford. Rapid increases/decreases in gage height observed at the gage during the irrigation season can be due to the effects of Ft. Lyon Canal gate changes and sluice gate operations, both of which are within three miles upstream of the gage.

Remarks.-- The record is considered to be fair due to the dynamic nature of the sand channel. Record during periods of ice-affected gage height should be considered poor. Station maintained by Adam Adame and record developed by Anthony Gutierrez and Thomas Ley.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07123000 ARKANSAS RIVER AT LA JUNTA

RATING TABLE-- ARKLAJCO42 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

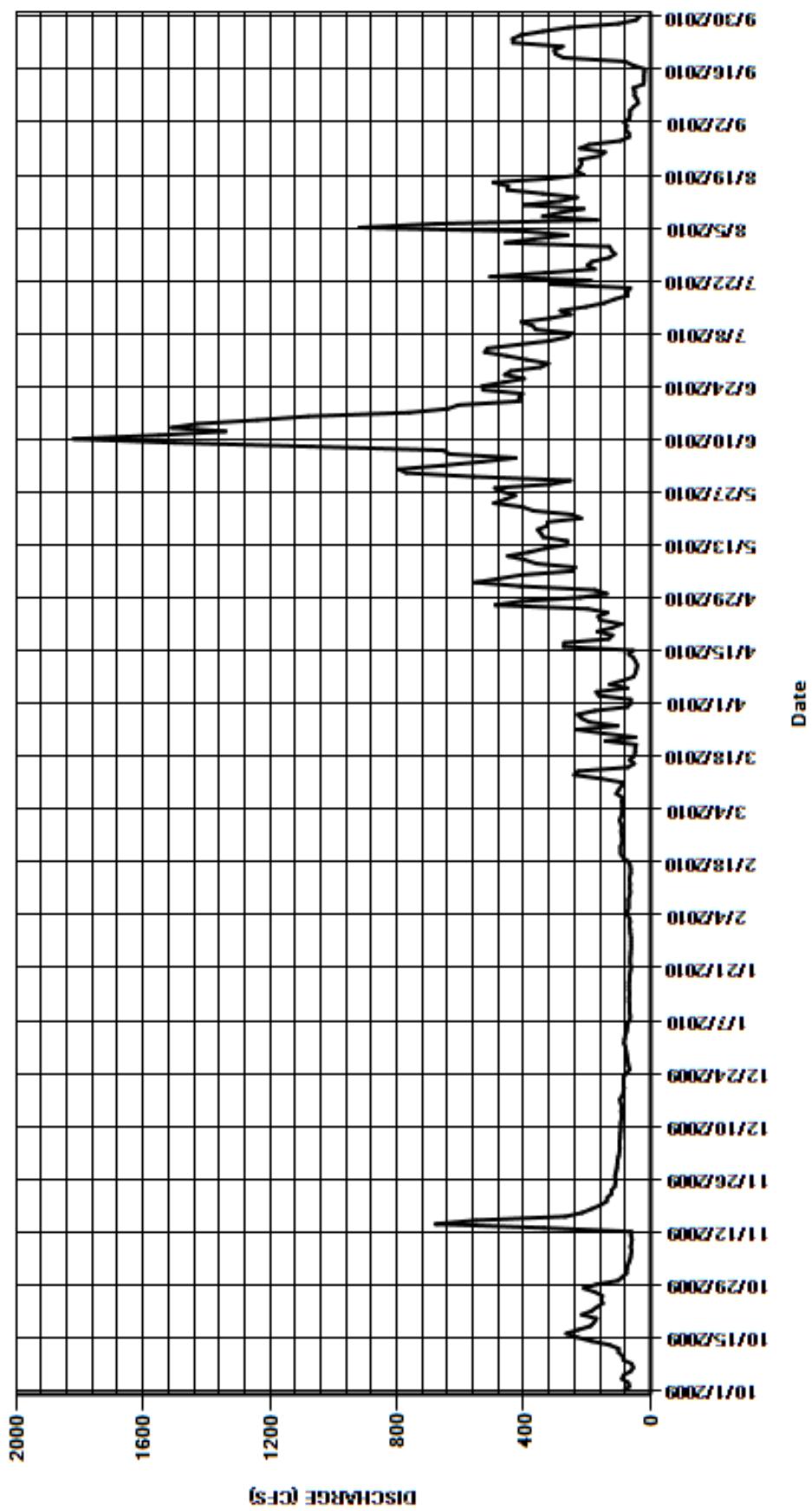
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	76	104	84	67	98	62	176	770	391	458	75
2	67	75	101	82	65	93	63	412	794	453	365	84
3	71	73	99	80	66	90	163	553	654	523	261	67
4	90	68	97	76	76	91	171	478	530	515	397	65
5	85	64	98	74	72	89	73	405	425	418	918	65
6	63	62	98	73	69	92	129	248	633	318	679	54
7	55	60	96	66	69	88	88	238	655	262	168	39
8	60	63	96	64	70	108	54	360	1070	249	340	43
9	86	60	94	66	66	101	48	398	1500	362	284	51
10	88	59	94	66	64	93	45	450	1820	372	211	50
11	101	62	94	66	66	89	42	384	1550	408	400	55
12	101	61	92	68	65	156	47	334	1340	316	284	22
13	130	337	92	68	66	241	54	263	1510	252	232	21
14	186	678	93	66	66	228	69	263	1430	284	339	21
15	231	550	91	68	63	72	55	339	1240	204	452	20
16	266	269	94	68	63	52	274	346	1080	147	449	19
17	228	216	97	68	65	66	272	356	761	115	496	56
18	189	187	89	66	70	52	133	326	640	72	315	81
19	178	159	86	66	86	49	120	324	606	73	211	274
20	171	139	84	64	94	49	168	219	414	64	235	300
21	217	137	86	62	94	46	121	248	415	314	224	304
22	186	124	85	64	95	143	92	370	404	189	217	277
23	170	123	85	64	90	48	159	404	528	506	223	434
24	151	113	76	64	89	148	165	494	531	332	160	435
25	156	111	66	63	92	233	136	458	463	176	144	410
26	152	112	70	62	93	104	199	427	399	199	223	339
27	176	112	72	62	92	193	490	465	460	185	194	257
28	211	109	74	62	93	218	406	491	441	131	95	102
29	171	106	76	62	---	230	222	316	348	112	68	46
30	103	105	78	64	---	176	138	253	322	124	69	34
31	89	---	80	64	---	73	---	556	---	130	79	---
TOTAL	4311	4470	2737	2092	2126	3609	4258	11354	23733	8196	9190	4100
MEAN	139	149	88.3	67.5	75.9	116	142	366	791	264	296	137
AC-FT	8550	8870	5430	4150	4220	7160	8450	22520	47070	16260	18230	8130
MAX	266	678	104	84	95	241	490	556	1820	523	918	435
MIN	55	59	66	62	63	46	42	176	322	64	68	19
CAL YR	2009	TOTAL	80454	MEAN	220	MAX	1220	MIN	26	AC-FT	159600	
WTR YR	2010	TOTAL	80176	MEAN	220	MAX	1820	MIN	19	AC-FT	159000	

MAX DISCH: 1970 CFS AT 17:45 ON Jun. 10,2010 GH 10.05 FT. SHIFT 0.72 FT.

MAX GH: 10.05 FT. AT 17:45 ON Jun. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**07123000 ARKANSAS RIVER AT LA JUNTA
WY2010 HYDROGRAPH**



ARKANSAS RIVER BASIN
HORSE CREEK AT HIGHWAY 194
Water Year 2010

Location.--	Lat. 38°05'06", Long. 103°21'12", in SE1/4, SW1/4, sec. 33, T.22S., R.53 W., Bent County, Hydrological Unit 11020008, on right bank 15 ft upstream from right end of box culverts on State Highway 194, 3.2 mi upstream from mouth, 3.4 mi downstream from Ft. Lyon Canal Aqueduct, and 7.5 mi west of Las Animas, Co.
Drainage and Period of Record.--	1403 sq.mi. Established and operated Oct. 19, 1979 to Sep. 30, 1993 by USGS. Operated and maintained by State of Colorado Oct. 1, 1993 to present.
Equipment.--	Sutron 8210 high data rate satellite-monitored data collection platform (DCP) with a Sutron constant flow bubbler sensor (CFB) in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage on the right side of the channel just upstream of the concrete weir control. A Texas Electronics Series 525 precipitation gage is operated at the site. Control is a compound 2-stage weir: Cipolletti weir for lower flows and rectangular broad crested weir for higher flows. No changes this water year.
Hydrologic Conditions.--	The Horse Creek watershed above the gage is approximately 1,420 sq miles and consists primarily of rangeland with native grasses and weeds dotted with the occasional cacti. Grazing along with irrigated and non-irrigated farming comprise the major land uses. Mean annual precipitation is 13.79 inches with soils moderately contributing to runoff. Streamflow exhibits seasonal variation with the majority of the natural flow resulting from high intensity – short duration summer thunderstorms. The Fort Lyon canal extends over the creek in a large diameter pipe approximately 2 miles above the gage and is capable of discharging canal water into the creek. The Fort Lyon augmentation station at Horse Creek (FLY AUG CO) is at the same location and will contribute to flows of 15 cfs to the gage during augmentation.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable except for the following periods when the gage heights were affected by ice: December 9, 10 and 25, 2009; January 8, 2010.
Datum Corrections.--	A level survey was last performed on October 4, 2007. On Nov. 27, 2007, a short level loop was re-run from RM7 in order to verify the Cipolletti weir crest and the staff gage elevations.
Rating.--	The compound Cipolletti - rectangular 2-stage weir control was installed in April 2005. The stainless steel Cipolletti weir controls low flows up to head of 1 foot or approximately 13.5 cfs. Medium flows are controlled by the rectangular second stage of the compound weir with flows up to 80.9 cfs. The high flows are controlled by the box culverts under Highway 194 and bank vegetation. There is a fence and drop structure on Horse Creek on the downstream side of Hwy 194. Weeds and debris can collect on the fence and cause the gage control structure to become submerged. When visiting this gage, care needs to be taken to ensure that the downstream fence is clear of debris. Rating No. 7 was developed during WY2005 based on the design and installation of the new compound control. Twelve discharge measurements (Nos. 295-306) were made during this water year, ranging in discharge from 4.37 to 32.1 cfs. The peak discharge of 137 cfs occurred at 0730 on March 22, 2010 at a gage height of 2.30 ft with a shift of 0.16 ft.
Discharge.--	Shifting section control used. Shifts were distributed by stage using variable stage-shift relationship SC10A for the water year. Measurements have shown that shifts are clearly a function of gage height associated with the compound weir. Shifts were percentage to zero when GHs are well below the crest of the Cipolletti Weir (about 0.80 ft), but are positive when gage heights are above the Cipolletti Weir and into the 2nd stage. Measurement number 305 was not utilized in the shift analysis due to moss affect. For lower flow measurements, where flow is controlled by the Cipolletti weir, non-zero shifts were adjusted to 0.00 feet. Measurement numbers 295, 297, 302, 304 and 306 were discounted between -5% and 6% for smoothing purposes in the shifting control methodology. Some of the percentages are large (6%) but were percentage to the shift curve based on the poor to fair quality of the measurements. The creek has a soft bottom leading to errors in depth readings. Often moss prevents good velocity readings as well. Past history and the scatter of measurements about a zero shift seem to indicate that the Cipolletti weir is following the theoretical rating. However, for flows in the transition between the 1st and 2nd stage and at higher flows, shifts increase to larger positive values. Fort Lyon Canal is approximately two miles upstream. The peak on March 22, 2010 was due to Fort Lyon Canal dumping water into the creek because of a drowning in the canal.
Special Computations.--	Ice affected gage heights were estimated using non affected adjacent gage height data and upstream hydrographs for validation. Ice affected days were determined using temperature data from the Adobe Reservoir gage approximately 14 miles to the northeast and the NOAA Las Animas gage approximately 9 miles to the east of the gage.
Remarks.--	Record is good except for periods of ice effect, which are estimated and poor. Station maintained by Adam Adame and record developed by Charlie DiDomenico.
Recommendations.--	A level survey of weir should be completed and cement-soil fill is needed along the right bank adjacent to the weir.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HORSE CREEK AT HIGHWAY 194

RATING TABLE--

HRC194CO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.5	10	5.9	4.6	3.8	4	8	34	22	10	14	10
2	5.5	9.9	5.7	4.6	3.8	4.4	15	32	20	17	7.4	6.6
3	5.8	10	5.6	4.5	3.9	4.6	15	27	8.7	11	11	5.4
4	5.8	8.8	5.5	4.5	4.7	4.6	7	14	7	5	33	4.7
5	11	8.6	5.5	4.6	5.1	4.3	6.8	12	13	5.6	56	4.8
6	17	7.4	5.5	4.6	4.7	4	16	11	17	5.2	56	4.6
7	14	12	5.4	4.3	4.5	3.9	22	12	12	5.8	44	4.2
8	6.8	20	5.5	4	4.3	6.7	16	12	5.8	12	36	6.2
9	6.7	14	5	3.6	4.2	9.4	7.4	10	6.5	20	43	19
10	6.5	7.8	4.8	3.3	4.1	7.4	11	9.4	15	17	42	25
11	6.6	7.2	4.2	3.2	4.1	6.2	18	9.3	17	18	33	15
12	6.9	7.5	4.1	3.1	4.1	5.6	16	10	9.8	23	23	6.6
13	7	7.5	4.1	3.1	4.1	5.3	7	11	12	16	14	8.1
14	7.1	6.6	4.2	3.2	4	5.2	10	11	24	8.5	12	7.7
15	7	7	4.2	3.2	3.8	4.9	7.5	18	21	7.3	12	5.7
16	6.8	7.3	4.2	3.2	3.7	5	14	21	11	6.7	22	5.8
17	6.7	7.6	4.3	3.4	3.6	5.3	23	22	16	6.3	21	6.9
18	6.6	7.6	4.5	3.4	3.7	9.6	17	17	20	6	9.3	5.4
19	8.7	7.3	4.5	3.5	3.7	15	8	38	17	13	8	5.1
20	9.9	7	4.5	3.6	3.7	12	9.2	46	18	19	7.1	4.7
21	10	6.9	4.6	3.6	3.7	6.1	23	39	29	17	6.5	9.7
22	16	6.6	4.7	3.8	3.6	69	24	19	22	19	5.8	19
23	22	6.4	4.8	3.8	3.5	18	12	14	24	24	5.6	17
24	27	6.1	4.8	3.8	3.5	22	11	13	22	29	9.3	11
25	21	6.1	4.8	3.7	3.6	21	24	12	9.4	25	10	5.7
26	14	6.2	4.8	3.6	3.5	25	33	11	7.3	16	12	5
27	17	6	4.8	3.6	3.5	26	30	18	10	11	18	7.4
28	24	6	4.7	3.6	3.6	25	21	24	17	9.7	13	7.6
29	18	5.9	4.8	3.5	---	19	21	16	13	9	5.5	7.2
30	11	5.8	4.8	3.5	---	9.3	31	8.9	6.2	12	4.9	5.5
31	10	---	4.6	3.7	---	7.9	---	9.8	---	18	7.8	---
TOTAL	347.9	243.1	149.4	115.7	110.1	375.7	483.9	561.4	452.7	422.1	602.2	256.6
MEAN	11.2	8.1	4.82	3.73	3.93	12.1	16.1	18.1	15.1	13.6	19.4	8.55
AC-FT	690	482	296	229	218	745	960	1110	898	837	1190	509
MAX	27	20	5.9	4.6	5.1	69	33	46	29	29	56	25
MIN	5.5	5.8	4.1	3.1	3.5	3.9	6.8	8.9	5.8	5	4.9	4.2

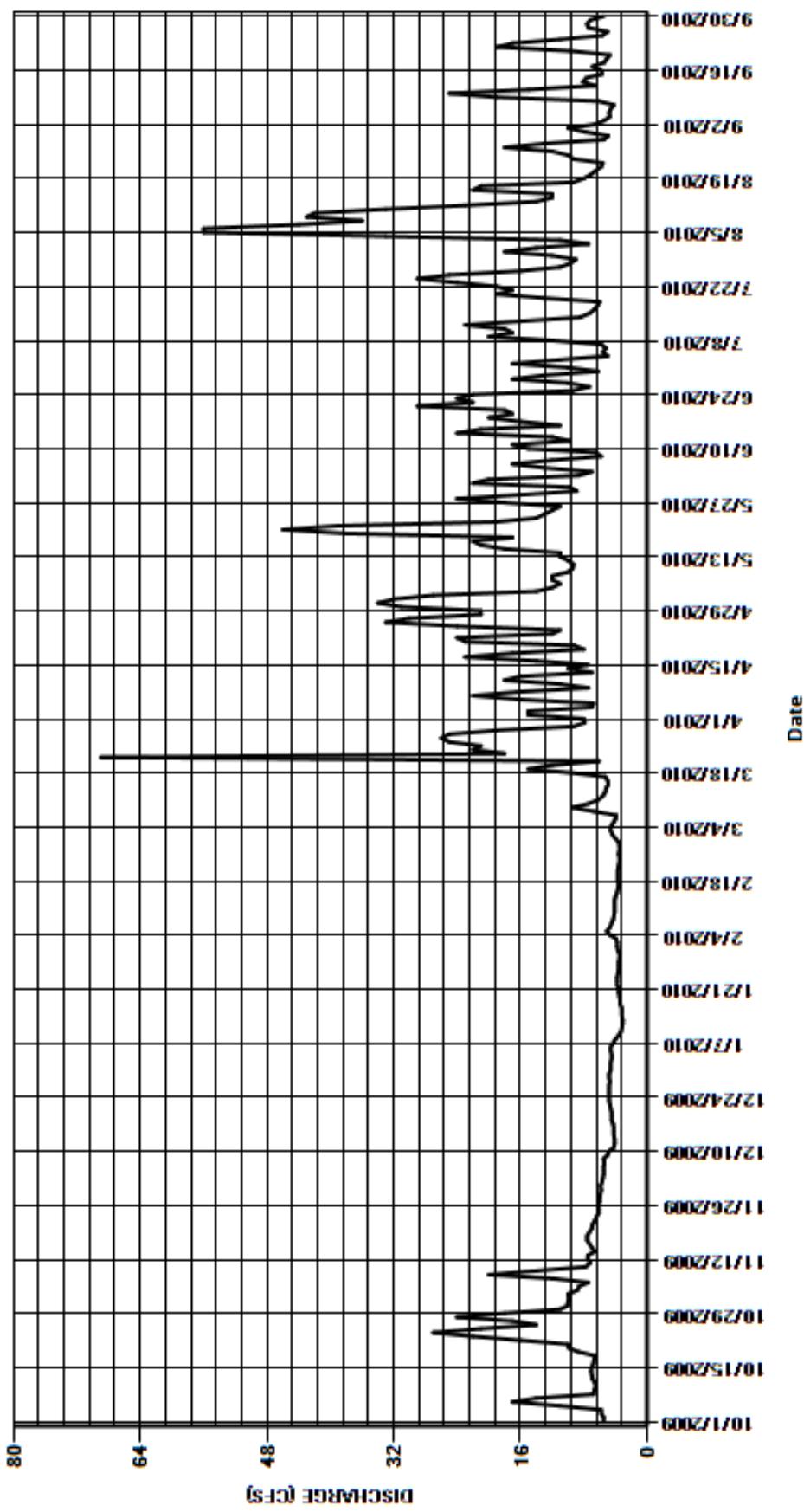
CAL YR	2009	TOTAL	3450.2	MEAN	9.45	MAX	48	MIN	3.3	AC-FT	6840
WTR YR	2010	TOTAL	4120.8	MEAN	11.3	MAX	69	MIN	3.1	AC-FT	8170

MAX DISCH: 137 CFS AT 07:30 ON Mar. 22,2010 GH 2.3 FT. SHIFT 0.16 FT.

MAX GH: 2.3 FT. AT 07:30 ON Mar. 22,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HORSE CREEK AT HIGHWAY 194
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
RATON CREEK ABOVE STARKVILLE, CO
Water Year 2010

Location.--	Lat. 37°07'35.5", Long. 104°31'24.8" in NW¼, NE¼, NE½, Section 35, T33S, R64W, Las Animas County, 20 feet away from the creek on the left upstream side of bridge for road 18.3 approximately half a mile south of Interstate 25 exit 8 south of Trinidad.
Drainage and Period of Record.--	54.49 sq.mi.
Equipment.--	Sutron SatLink data collection platform (DCP) with High Data Rate (HDR) radio and shaft encoder. The data logger is housed inside a 4 ft x 4 ft metal shelter about 20 feet from the creek, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an armored 18 inch corrugated metal pipe stilling well attached to the left wing wall on the upstream side of the bridge. A Texas Instruments rain gage is mounted on the antenna mast. Shaft encoder is set to an electric drop tape inside the half shelter and well. No changes this water year.
Hydrologic Conditions.--	The gage is situated in a valley at the town of Starkville approximately two miles above the Purgatoire at Trinidad gage. The gage is subject to flash flooding from the higher mountainous area above the gage with several smaller tributary streams. The channel is contained on the left side by railroad tracks set higher and a sheer wall several feet higher, the right side is contained by the county road for about a hundred feet and then the valley wall. Channel work done by Las Animas County as part of bridge repair changed the shape of the channel, along with a rain event that washed out two corrugated metal pipes changed the elevation of the control on June 30, 2010.
Gage-Height Record.--	Primary record is hourly averages of fifteen minute satellite data with the DCP log data used for back-up purposes. Record is complete and reliable, except for the following periods: November 15-19, 24-26, 29, December 2, 13-16, 18-20, 27-31, 2009, January 1-11, 24-31, February 1-28, March 1-3, 20, 21, 24-26, when ice in the creek and/or well affected the stage-discharge relationship; and, December 3-12, 24-26, 2009, when the well was frozen; and, June 17-18, 2010, when the DCP failed to log data for most of both days.
Datum Corrections.--	No levels were run this year. Previous levels were run September 18, 2007. No corrections were needed.
Rating.--	The control at low flows up to 10 cfs is a gravel riffle in the creek channel. Control at medium to high stage includes the riverbanks and brush lining the edges of the channel as well as the bridge. The control for low to medium and high flows is now a gravel/cobble riffle that extends the full width of the bridge, with a small island immediately upstream of the bridge. Extreme high flows can go out of the channel on the right bank into an area upstream and extending approximately 30 feet south of the bridge and on the left bank 30 feet to the north which is at a slightly lower elevation than the gage. The extreme high flow would bypass the gage on the left side. Rating No. 1, dated July 8, 2003, was used for the entire water year. Rating No. 1 is well defined to about 40 cfs. The rating curve was developed based on channel surveys and computer modeling. Fourteen discharge measurements (Nos. 109 – 122) were made during water year, with measurements 109 and 122 being observations of zero flow. Measurements ranged in discharge from 0.00 to 12.8 cfs. They cover the range in stage experienced, except for the higher daily flows of March 30, 31; April 1 – 7, 12 – 17; July 31, 2010. The peak discharge of 197 cfs occurred at 0415 April 13, 2010 at a gage height of 4.76 ft with a shift of 0.07 ft. It exceeded Measurement No 114, made April 7, 2010 by 1.36 feet in stage.
Discharge.--	Shifts were applied as defined by measurements and were distributed by a combination of time and stage. Shifts were distributed by time with consideration of stage from 0000 October 1, 2009 to the peak at 0415 April 13, 2010. Shifts were distributed by stage using variable stage shift relationship RACRSTCOVS10A, based on Msmts 115-122, from the 0500 April 13 to the end of the water year. This shift curve takes into account many scour and fill events during the period of application. Open water measurements indicated shifts varying from -1.18 to +0.07 ft. All open water measurements were given full weight.
Special Computations.--	Part of the changes in shift are due to channel work under the bridge immediately above the gage. Gravel and material are periodically "pushed" in by the landowner below the gage to keep the flow channeled to the right side. Other changes in shift are due to a small diversion dam that has deteriorated and moved downstream. The July 11 rain caused the diversion dam control to be either covered or washed out. This changed the shape of the channel and effectively raised the PZF of the gage. This gage will often go dry during the water year causing shifts too often be disconnected from one measurement to the next. Temperature record from Trinidad, a hydrograph, and measurements 110 – 114 were used for estimating flows during periods of ice effect. Periods of zero flow were verified by observation visits nos. 109 and 122.
Remarks.--	Prior to the rain on July 11, record is good, when the gage height is between 1.50 and 3.08 feet. Periods of record when the gage height is greater than 3.08 ft should be considered fair to poor. After July 11, gage heights over 2.80 are starting point of good record. Periods of ice effect should be considered poor. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RATON CREEK ABOVE STARKVILLE, CO

RATING TABLE--

RACRSTCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0.71	0.43	0.27	0.25	0.54	22	6.5	2.3	0.68	4.8	0.1
2	0	0.67	0.4	0.27	0.25	0.54	17	6.4	2.2	0.66	2	0.04
3	0	0.65	0.35	0.27	0.3	0.58	14	6	2.2	1.2	1.1	0.03
4	0	0.61	0.35	0.27	0.3	0.67	14	5.8	2	0.78	1.7	0.01
5	0	0.61	0.35	0.27	0.3	0.69	16	5.3	1.8	0.65	2.1	0
6	0	0.6	0.35	0.25	0.3	0.69	17	5	1.9	0.54	1.2	0
7	0	0.6	0.35	0.2	0.35	0.72	13	4.8	2	0.53	3	0
8	0	0.59	0.35	0.2	0.35	2.6	12	4.7	1.6	1.1	0.75	0
9	0	0.57	0.35	0.2	0.35	1.9	11	4.6	1.4	1.5	6.9	0
10	0	0.55	0.35	0.2	0.35	1.2	11	4.6	1	9.6	7	0
11	0	0.55	0.35	0.2	0.35	0.93	12	4.4	0.99	2.5	3.7	0
12	0	0.55	0.35	0.25	0.35	0.89	13	4.4	1.3	0.29	2.3	0
13	0	0.55	0.35	0.23	0.35	0.92	54	5.8	1.9	0	1.8	0
14	0	0.55	0.35	0.21	0.35	0.93	24	6.1	1.7	0	1	0
15	0	0.5	0.35	0.2	0.37	0.88	17	4.7	1.3	0	0.98	0
16	0	0.5	0.33	0.2	0.37	0.9	14	4.3	0.98	0	1	0
17	0	0.5	0.37	0.2	0.4	1.2	13	4.3	0.95	0	0.98	0
18	0	0.5	0.33	0.2	0.4	2	12	4.2	0.89	0	0.92	0
19	0	0.56	0.33	0.2	0.4	1.7	11	4.2	0.77	0	0.83	0
20	0	0.56	0.3	0.2	0.4	0.95	10	4	0.71	0	0.76	0
21	0.03	0.56	0.35	0.2	0.4	1.2	9	3.6	0.68	0	0.71	0
22	0.05	0.56	0.35	0.21	0.4	1.7	9.8	3.4	0.6	0	0.64	0.45
23	0.41	0.56	0.35	0.22	0.45	2.2	9.7	3.3	0.61	0	0.65	1.8
24	0.52	0.5	0.27	0.2	0.45	1.2	8.7	3.3	0.98	0	0.71	0.14
25	0.52	0.5	0.27	0.2	0.45	2	7.8	3.3	2.3	0.01	0.68	0
26	0.55	0.5	0.27	0.2	0.5	6	7.3	3.2	1.5	0	0.58	0
27	0.55	0.55	0.27	0.22	0.5	6.1	7	3.1	2.5	0	0.42	0
28	0.55	0.48	0.27	0.23	0.5	4.8	6.8	2.9	0.99	0	0.33	0
29	0.55	0.4	0.27	0.25	---	9.5	6.6	2.7	0.86	0	0.35	0
30	0.56	0.42	0.27	0.25	---	18	6.5	2.6	0.74	3.1	0.27	0
31	0.68	---	0.27	0.25	---	22	---	2.4	---	21	0.17	---
TOTAL	4.97	16.51	10.25	6.92	10.49	96.13	406.2	133.9	41.65	44.14	50.33	2.57
MEAN	0.16	0.55	0.33	0.22	0.37	3.1	13.5	4.32	1.39	1.42	1.62	0.086
AC-FT	9.9	33	20	14	21	191	806	266	83	88	100	5.1
MAX	0.68	0.71	0.43	0.27	0.5	22	54	6.5	2.5	21	7	1.8
MIN	0	0.4	0.27	0.2	0.25	0.54	6.5	2.4	0.6	0	0.17	0

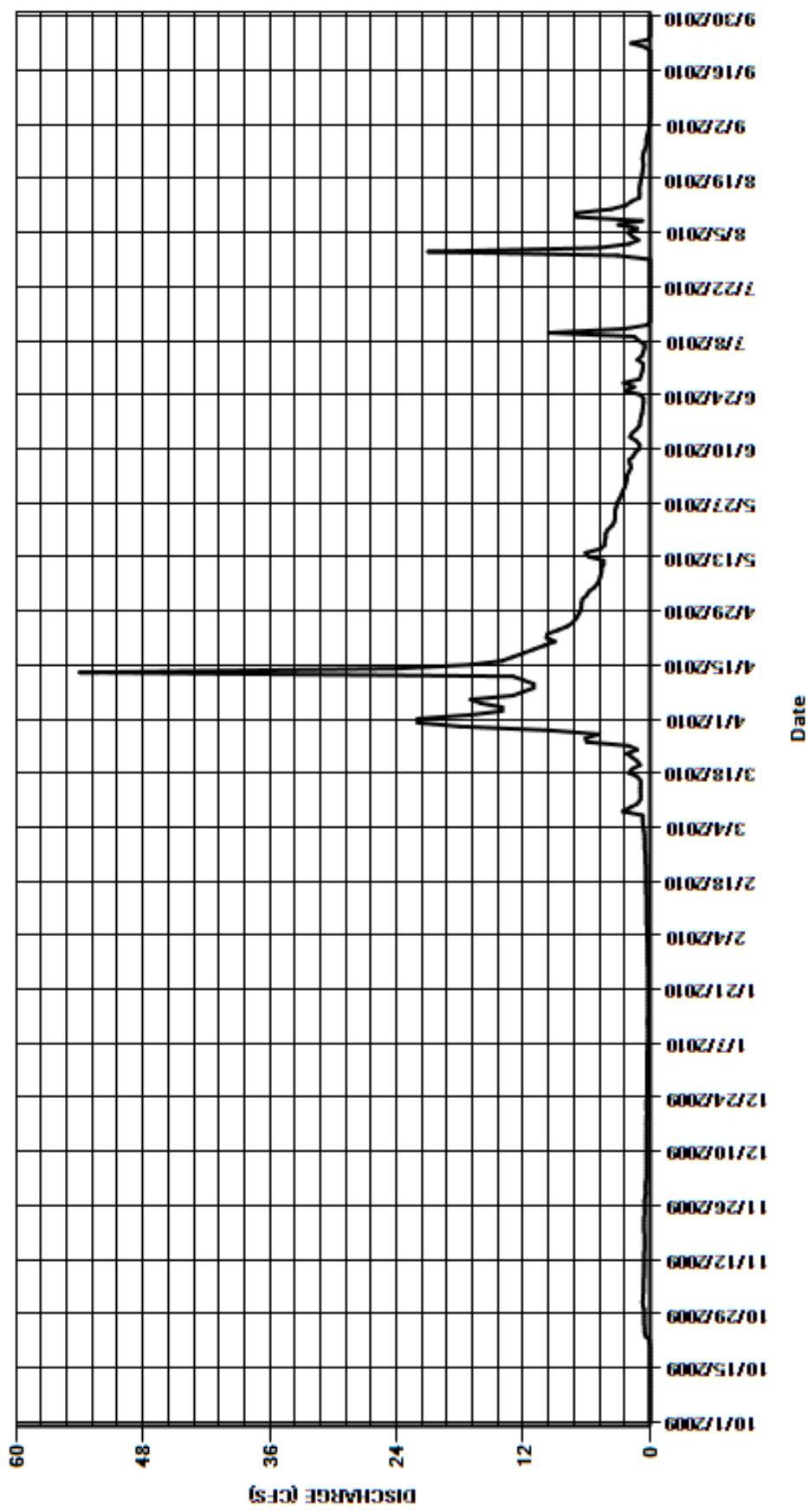
CAL YR	2009	TOTAL	213.54	MEAN	0.59	MAX	6.4	MIN	0	AC-FT	424
WTR YR	2010	TOTAL	824.06	MEAN	2.26	MAX	54	MIN	0	AC-FT	1630

MAX DISCH: 197 CFS AT 04:15 ON Apr. 13,2010 GH 4.76 FT. SHIFT 0.07 FT.

MAX GH: 4.76 FT. AT 04:15 ON Apr. 13,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RATON CREEK ABOVE STARKVILLE, CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07124500 PURGATOIRE RIVER AT TRINIDAD
Water Year 2010

Location.--	Lat. 37°10'21", Long. 104°30'27", in NW 1/4 SE 1/4 sec. 13, T.33 S., R.64 W., Las Animas County, in city of Trinidad, on left bank. This is at the west end of the Commercial Street Bridge 20 feet upstream.
Drainage and Period of Record.--	795 mi ² .
Equipment.--	Sutron 8210 High Data Rate DCP (satellite monitored data collection platform) connected to a Sutron Constant Flow Accubar Bubble Gage and Recorder (CFB) inside a 4 ft x 4 ft steel shelter on the left bank above the main channel. The CFB is connected to an orifice line inside a 1.5-inch galvanized pipe, which is anchored to the bank extending down and into the channel. The primary reference is a wire weight gage on the Commercial Street Bridge immediately downstream and in line with the orifice line and staff gage set in the streambed near the orifice. A Texas Electronics Series 525 rainfall sensor is also monitored by the DCP. No changes were made this year.
Hydrologic Conditions.--	The gage is located in the city of Trinidad approximately 3.5 miles downstream of the Trinidad Lake Reservoir and 2.65 miles downstream from the confluence with Raton Creek. It is on a fairly straight section of channel above and below the gage at an elevation of 5992 feet above MSL, with a drainage area of 795 sq.mi. The left side of the channel consists of gravel and small cobble at the orifice pool with the right side having fairly heavy vegetation consisting of grass to trees above and below the bridge. The regulation of Trinidad reservoir greatly influences the flow at the gage in town, while Raton Creek is subject to flash flooding. A small amount of irrigation is above the gage as well as the intake pipes for the city of Trinidad water supply. Urban runoff can affect the gage.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable, except for the following periods: Oct. 25, 26, 28 – 30; Nov 15–17, 25, 24, 29-30; Dec 3 – 11, 15, 16, 23 – 31, 2009; Jan 1 – 10, 12, 15 – 18, 23 – 31; Feb 1–28; Mar 1, 2, 20, 21, 24, 25, 2010 when ice at or near the gage affected the gage height. Missing data on June 19 and 28 and on July 12 – 14 was supplied from the DCP backup. Missing data on July 20 and 21 due to equipment problems was also supplied from DCP backup.
Datum Corrections.--	No levels were run this water year. Levels were last run June 21, 2007. No corrections needed.
Rating.--	The river channel consists of gravel to small cobble from the reservoir down to a diversion dam 500 feet below the gage. The control for low flows is a gravel riffle below the gage under the bridge. Medium flows of up to 400 – 500 cfs are controlled by the channel, with dense vegetation on either side, or the center pier of the bridge. High flows are confined on the right bank by a stone and masonry wall which changes to a three foot high "river walk" wall on the right across from the gage and under the bridge and on the left bank by a gunite and rock wall to an elevation of ~11 feet (9000 cfs by USGS extension). Discharge of up to 9000 cfs can be contained under the Commercial Street Bridge, with higher flow coming out of the left bank and flooding the area immediately next to the river including the railroad tracks less than 40 feet from the river. Rating 28 was used the entire water year. Fifteen measurements (Nos. 1276 – 1290) made during the water year ranged from 0.79 to 272 cfs. They cover the range in stage except for the lower daily flows on February 19 – 21 and the higher daily flows of June 1 – 3, 7 – 14, August 3 – 5, 9 – 11. The peak discharge of 674 cfs occurred at 1615 on August 7, 2010 at a gage height of 3.72 ft with a shift of -0.11 ft. It exceeded measurement No. 1284 made June 3, 2010 by 0.81 feet in stage.
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed by time and event for the period from October 1, 2009 thru September 30, 2010. All measurements were made in open channel and were given full weight with the exception of Nos. 1285 and 1287, which were both discounted -1% for smoothing purposes. Measurement no. 1277 – 1280 were made during periods of ice-affected gage heights. Measurements this year showed shifts ranging from -0.15 feet to -0.06 feet. The peak discharge of August 7, 2010 was the result of a rain event in the area that produced ~0.40 inches of precipitation.
Special Computations.--	Discharge during periods of ice were estimated using measurements 1277 – 1280, a hydrograph and temperature data from the Trinidad weather station.
Remarks.--	Record is considered to be good during periods of open channel and fair to poor during periods of ice affected gage height record. Winter releases from Trinidad Reservoir often help reduce the amount of ice in the channel. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	Shifts have continued to be negative from Water Year 2008, possibly due to the I-25 bridge construction upstream of the gage, which has at times worked in the river. The consistency of measured shifts from March 2008 to present indicates a modification to Rating 28 is needed. Any changes to the rating should not be done until the highway construction is completed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07124500 PURGATOIRE RIVER AT TRINIDAD

RATING TABLE--

PURTRICO28 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

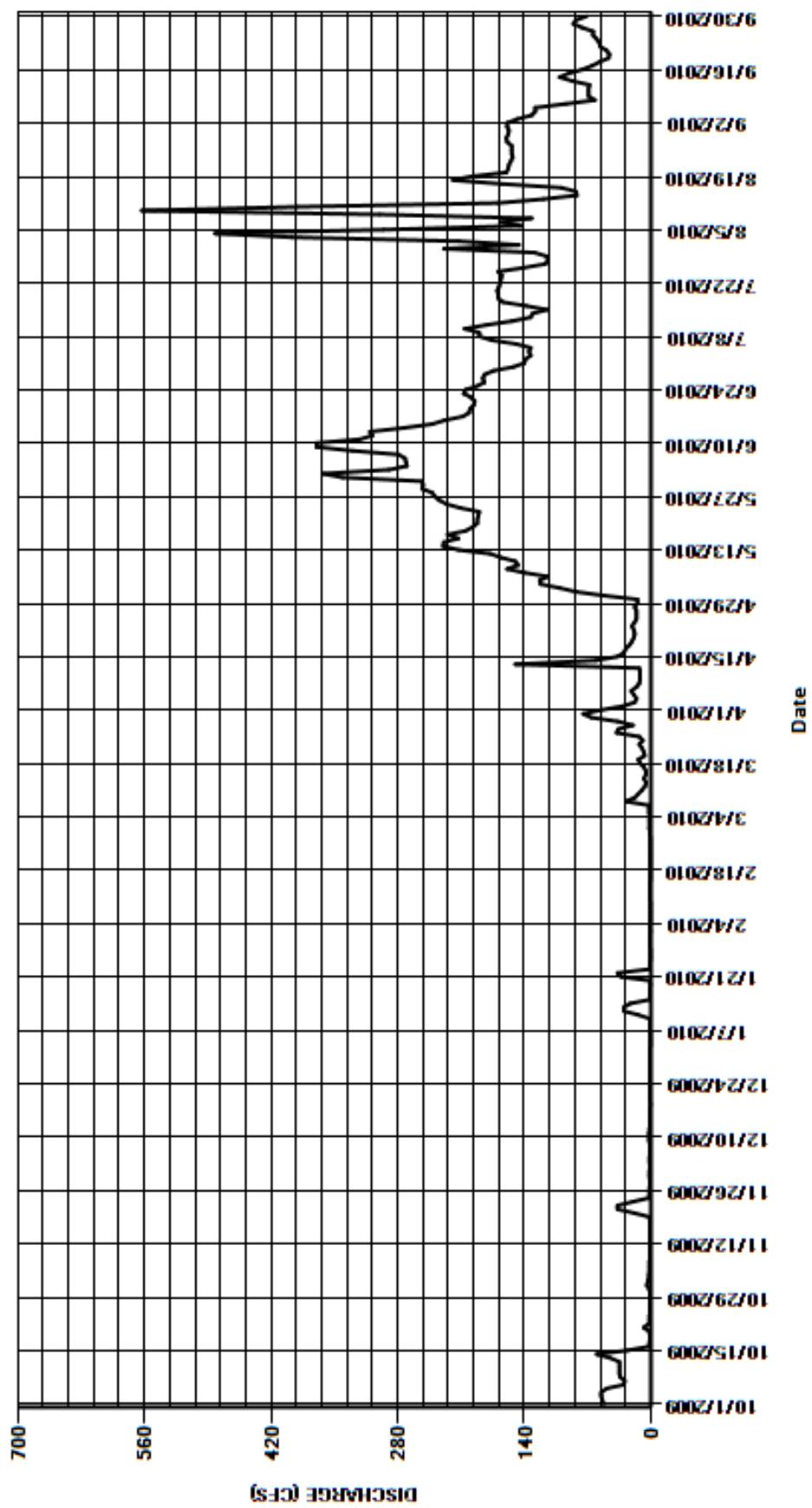
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	4.5	1.6	1.1	1.1	1.9	55	52	341	140	146	159
2	54	3.6	1.2	1.1	0.85	1.5	31	83	363	139	213	159
3	55	2.5	1.5	0.85	1	1.7	18	101	290	133	397	148
4	55	2.2	1.5	0.85	0.85	1.8	16	122	270	135	482	132
5	49	1.7	1.5	0.85	0.8	2	19	123	271	133	296	128
6	30	1.7	1.3	0.85	0.75	2	22	114	272	149	144	128
7	29	1.7	1.2	1.2	0.75	2	16	140	279	176	165	94
8	34	1.4	1.3	0.9	0.9	28	13	159	330	190	132	62
9	35	1.2	2	0.9	0.8	18	12	147	370	190	300	69
10	35	1.5	2	0.9	0.9	14	12	150	370	206	563	69
11	35	1.2	2.2	14	0.9	9.9	12	166	322	182	392	69
12	35	1.5	1.6	30	0.9	6.5	13	178	308	154	169	68
13	45	1.1	1.2	30	0.9	5.3	150	213	311	133	119	87
14	60	1.1	1	23	0.9	7.8	61	230	273	131	82	101
15	26	1.5	0.9	1.5	0.9	5.9	37	229	242	115	83	91
16	2.3	1	1.1	1.1	0.85	5.7	30	213	228	138	99	76
17	1.6	1	1	1	0.85	7.8	28	225	208	164	165	65
18	1.4	1.4	0.9	1	0.9	12	24	205	201	169	219	57
19	1.2	1.7	0.86	0.81	0.7	14	21	197	200	169	198	47
20	2.1	18	1.1	1	0.75	7	19	192	196	170	160	46
21	8.1	37	1.1	33	0.7	8	18	192	195	168	158	49
22	2.2	37	1	37	0.8	10	19	191	199	167	157	56
23	1.8	20	1.2	1.3	0.8	13	21	190	207	166	155	57
24	1.7	1.8	1.2	1.1	0.8	9	18	211	205	165	153	60
25	1.1	1.9	0.9	0.95	0.8	13	16	226	192	169	154	64
26	1.1	1.5	1	0.8	0.85	38	16	234	184	141	154	64
27	1.5	1.5	0.9	0.92	0.9	36	16	239	186	117	154	76
28	1.1	1.2	0.9	0.82	0.95	20	18	242	184	114	159	86
29	1.1	1.5	0.9	1.1	---	37	15	253	174	115	160	83
30	1.1	1.7	0.9	1.3	---	66	15	252	152	129	158	71
31	1.8	---	0.9	1.2	---	75	---	253	---	229	157	---
TOTAL	660.2	156.6	37.86	192.40	23.85	479.8	781	5722	7523	4796	6243	2521
MEAN	21.3	5.22	1.22	6.21	0.85	15.5	26	185	251	155	201	84
AC-FT	1310	311	75	382	47	952	1550	11350	14920	9510	12380	5000
MAX	60	37	2.2	37	1.1	75	150	253	370	229	563	159
MIN	1.1	1	0.86	0.8	0.7	1.5	12	52	152	114	82	46
CAL YR	2009	TOTAL	22609.54	MEAN	61.9	MAX	268	MIN	0.86	AC-FT	44850	
WTR YR	2010	TOTAL	29136.71	MEAN	79.8	MAX	563	MIN	0.7	AC-FT	57790	

MAX DISCH: 674 CFS AT 16:15 ON Aug. 07,2010 GH 3.72 FT. SHIFT -0.11 FT.

MAX GH: 3.72 FT. AT 16:15 ON Aug. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07124500 PURGATOIRE RIVER AT TRINIDAD
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
Water Year 2010

Location.--	Lat. 37°42'53", Long. 103°30'38", in NW 1/4 sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon. Prior to Apr. 21, 1978 gage located 850 ft, upstream.
Drainage and Period of Record.--	2,752 mi ² .
Equipment.--	Sutron Constant Flow Bubbler water level sensor and satellite-monitored data collection platform (Sutron 8210 HDR DCP) in a 4 ft by 4 ft steel shelter. The primary gage is an outside drop tape from a reference point on a steel "I" beam on the wall face between Ninemile Dam and the Ninemile Canal headgate. Control is the Ninemile Dam. No changes.
Hydrologic Conditions.--	Characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: December 3-31, 2009; January 1-9, 21, 29-31, 2010; and February 7-10, 21-25, 2010 when the stage-discharge relationship was affected by ice on the control. On March 14, 2010 there were three unit values of satellite data missing. These data were filled in from adjacent data given the short time period and gage height stability without loss of accuracy. Primary stage sensor calibration to reference gage supported by 21 visits this water year. The following corrections were applied to the gage height record: June 23 – July 8, 2010, prorated from 0.00 to 0.06 ft correction; August 19 – September 1, 2010, prorated from 0.00 to -0.04 ft correction.
Datum Corrections.--	Levels were last run Aug 22, 2008.
Rating.--	The control is the Ninemile Canal diversion dam which is constructed of wood timbers. Data for the stage-discharge relationship at this location is based on stage data collected on the upstream side of the diversion dam and discharge measurements made below the dam. Observations of zero flow past the dam are corroborated by measurements of zero flow in the channel below the dam. Upstream from the dam, water will pond in bedrock pockets and holes. At low to medium flows, debris will collect along the dam and will clear at higher flows, thus changing the shift. Rating No.17 was developed on October 5, 1998 and was used the entire water year. Rating No. 17 is well defined to about 500 cfs. Fifteen discharge measurements (Nos. 1008-1022) were made ranging in discharge from 0 to 84.1 cfs. WY2010 measurements covered the range in stage experienced except for the higher daily flows of March 9-13, 20, 27-31; April 1-9, 11-22, 24-25; May 4; June 11-12; July 7-8; August 1-2, 5-8, 11-13, 2010. The peak instantaneous flow of 1500 cfs occurred at 0700 on April 22, 2010 at a gage height of 4.74 ft with a shift of -0.04 ft. It exceeded the stage of measurement No. 1014, made May 4, 2010, by 1.30 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed by time proration for the water year. Open water measurements showed shifts ranging from -0.08 to +0.03 feet. All measurements were given full weight and applied directly. Stage related shift changes were as larger runoff events occurred at the gage reflecting scour of the gage pool above the control and migration of shifts to the left. Shifts are seen to migrate back to the right as the gage pool fills. Shifts computed from observations of zero flow were applied to periods of low or no flow. In several cases debris on the dam resulted in large negative shifts.
Special Computations.--	Flows during periods of ice effect were estimated using NOAA air temperature data from the La Junta 1S temperature gage located approximately 15 miles north from the gage, partial day good record and good record before and after ice effect.
Remarks.--	Record fair, except during periods of ice effect and flows over 500 cfs, which should be considered poor. The record for total flow in the river at this location is computed by adding Ninemile Canal flows to this record. Station maintained and record developed by Adam Adame.
Recommendations.--	High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE

RATING TABLE--

PURNINCO17 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

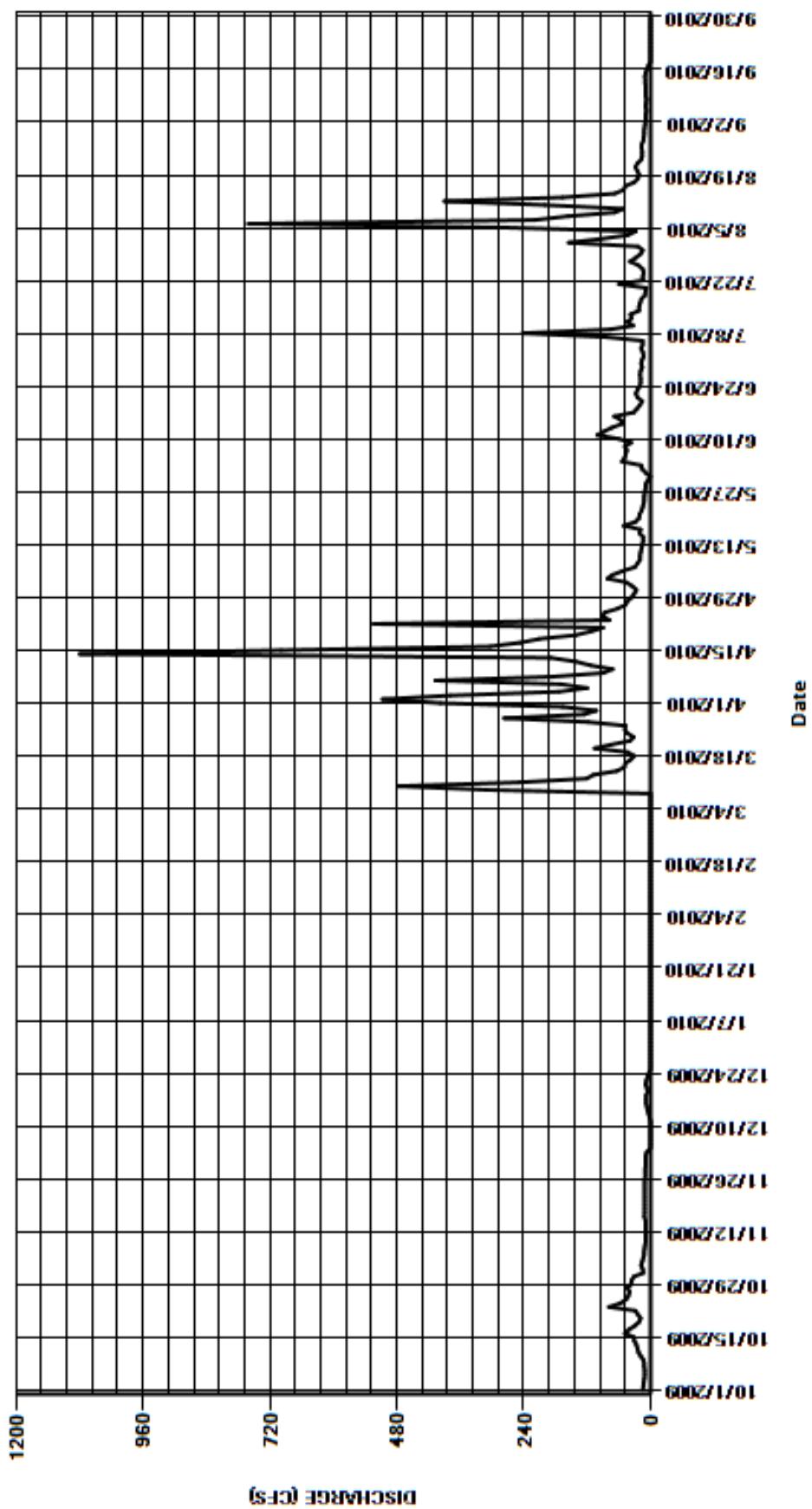
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	14	9.9	0	0	0	398	27	9.2	16	155	11
2	14	15	9.8	0	0	0	507	35	16	13	94	10
3	13	18	7.5	0	0	0	379	46	18	15	43	9.8
4	12	16	0.52	0	0	0	174	82	54	18	28	9.4
5	11	14	0	0	0	0	120	72	49	15	276	8.1
6	11	12	0	0	0	0	169	53	47	15	761	9.6
7	12	12	0	0	0	0	407	30	45	85	219	9
8	12	11	0	0	0	0	186	25	49	242	156	7.9
9	14	10	0	0	0	309	89	20	37	77	68	10
10	19	9.8	0	0	0	478	72	20	60	33	51	9.7
11	23	9.7	0	0	0	249	114	19	101	44	200	9.2
12	25	9.6	1.5	0	0	121	142	17	88	36	390	10
13	27	9.7	3.5	0	0	108	189	16	73	38	167	10
14	31	9.8	6	0	0	64	1080	14	54	22	68	11
15	32	10	7	0	0	50	699	14	56	22	51	9.5
16	49	12	9	0	0	48	304	21	69	20	48	6.9
17	41	11	9	0	0	38	247	19	32	18	31	3.9
18	30	11	9	0	0	31	211	51	26	11	24	0
19	22	11	6	0	0	44	142	29	20	10	22	0
20	19	11	7	0	0	106	113	22	16	8.4	25	0
21	24	11	10	0	0	75	90	21	25	60	29	0
22	29	11	8	0	0	39	524	17	28	14	25	0
23	79	11	6	0	0	32	78	15	25	15	18	0
24	57	11	3	0	0	44	91	13	20	13	16	0
25	46	11	0	0	0	49	87	12	19	15	16	0
26	42	11	0	0	0	47	63	12	19	23	17	0
27	40	10	0	0	0	118	48	11	20	39	17	0
28	44	10	0	0	0	277	44	10	19	28	14	0
29	37	10	0	0	---	126	36	9.8	16	19	13	0
30	36	9.8	0	0	---	103	31	5.4	18	15	12	0
31	32	---	0	0	---	166	---	0.53	---	24	12	---
TOTAL	897	342.4	112.72	0.00	0.00	2722.00	6834	758.73	1128.2	1023.4	3066	155.00
MEAN	28.9	11.4	3.64	0	0	87.8	228	24.5	37.6	33	98.9	5.17
AC-FT	1780	679	224	0	0	5400	13560	1500	2240	2030	6080	307
MAX	79	18	10	0	0	478	1080	82	101	242	761	11
MIN	11	9.6	0	0	0	0	31	0.53	9.2	8.4	12	0
CAL YR	2009	TOTAL	7013.32	MEAN	19.2	MAX	737	MIN	0	AC-FT	13910	
WTR YR	2010	TOTAL	17039.45	MEAN	46.7	MAX	1080	MIN	0	AC-FT	33800	

MAX DISCH: 1500 CFS AT 07:00 ON Apr. 22,2010 GH 4.74 FT. SHIFT -0.04 FT.

MAX GH: 4.74 FT. AT 07:00 ON Apr. 22,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
Water Year 2010

Location.--	Lat. 37°42'53", Long. 103°30'38", in NW ¼ sec. 7, T.27 S., R.54 W., Otero County.
Drainage and Period of Record.--	N/A
Equipment.--	Float-activated graphic water-stage recorder, SDI shaft encoder, and a High Data Rate Sutron SatLink DCP in a 3 ft by 3 ft steel shelter with well. Six-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes this water year.
Hydrologic Conditions.--	The Ninemile Canal diverts water from the Purgatoire River approximately 75 miles downstream from Trinidad Reservoir. The basin as a whole encompasses approximately 2870 square miles with nearly 18 percent of the basin above 7500 feet in elevation and the mean elevation at 6270 feet. Mean annual precipitation for the basin is approximately 16.8 inches. The influence of urbanization in the basin along with reservoir operations and irrigation practices provides the largest affect to the runoff regime. No changes evident this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable, except for the periods: December 3-13, 19-28, 2009, January 5-10, 15-21, 25-31, February 1-2, 8-11, 20-23, 2010 when the stage-discharge relationship was affected by ice; May 21-June 1, September 17-20, 2010 when the gage height was incorrectly set after cleaning the well; June 1-2, 2010, when the stilling well was filled with mud above lower intake and floats were stuck on mud.
Datum Corrections.--	No levels were run to the flume this water year.
Rating.--	Control is a standard 6-ft concrete Parshall Flume. A standard 6-foot Parshall flume rating was used the entire water year. No discharge measurements were made this water year. The peak flow of 42 cfs occurred at 1145 on April 7, 2010 at a gage height of 1.42 ft (gage height correction of -0.02 ft applied) with a shift of 0.00 ft.
Discharge.--	No discharge measurements were made this water to confirm the accuracy of the standard Parshall flume rating curve. Historically, measurements have been adjusted to provide for a zero shift at this structure. Discharge record was computed by direct application of the rating to the corrected gage height record.
Special Computations.--	Flows during periods of ice effect were estimated using temperature records, partial day good record and good record before and after ice effect.
Remarks.--	Record is good, except for periods of ice effect, which are estimated and considered poor. Station maintained and record developed by Adam Adame.
Recommendations.--	Discharge measurements should be scheduled once per year during the irrigation season to verify the accuracy of the standard rating table. Additionally, a levels survey and flume inspection should be completed to verify the condition of the flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE

RATING TABLE--

NMCHIGCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

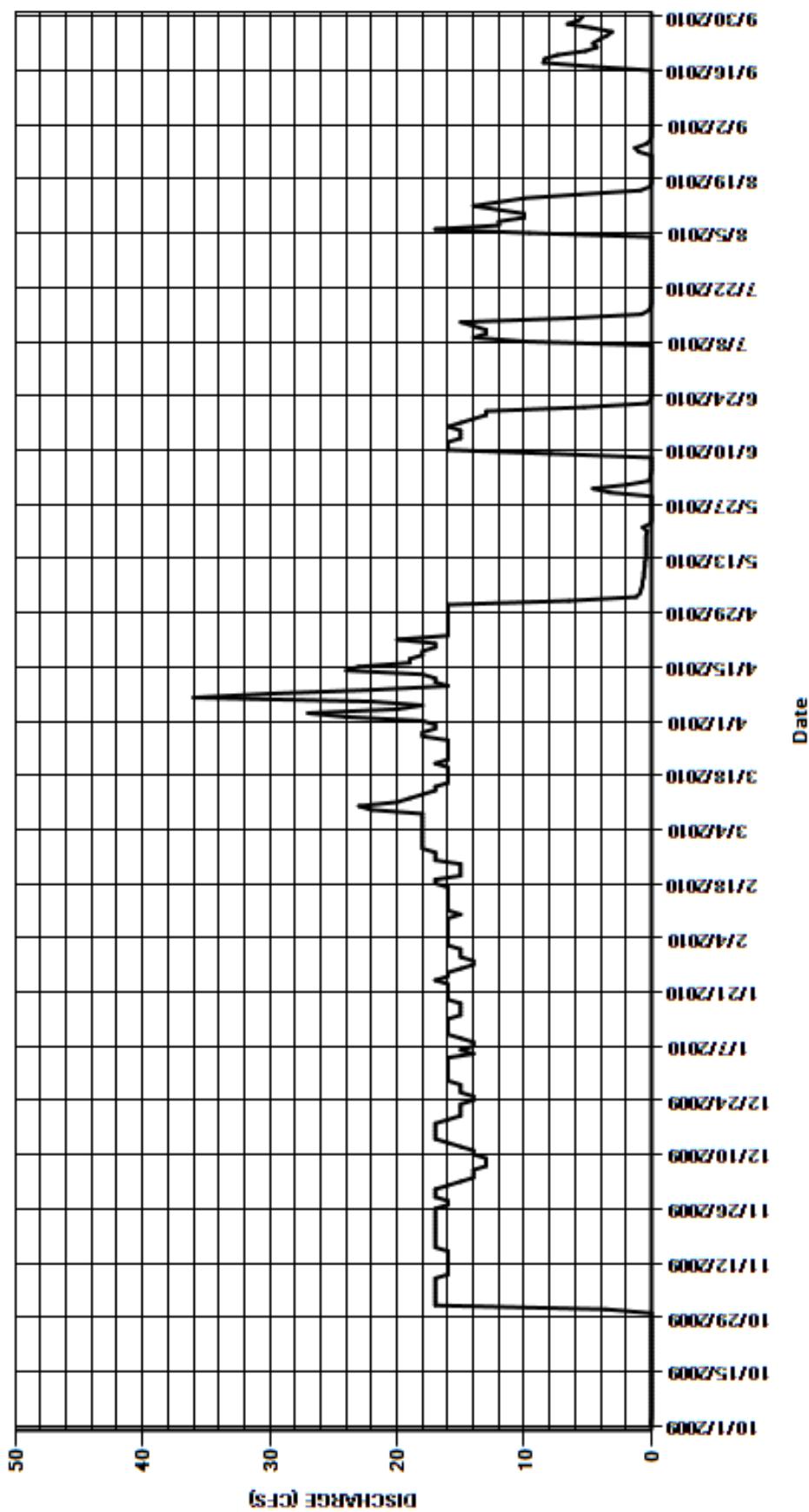
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.06	17	17	16	15	18	18	16	1.9	0	0	0
2	0.04	17	16	16	16	18	24	6.5	0.18	0	0	0
3	0.02	17	15	16	16	18	27	1.2	0.1	0	0	0
4	0	17	14	16	16	18	20	0.9	0.04	0	0	0
5	0	17	14	14	16	18	18	0.82	0.01	0	9.6	0
6	0	17	14	15	16	18	22	0.72	0	0	17	0
7	0	17	13	14	16	18	36	0.71	0	0	12	0
8	0	17	13	14	16	18	30	0.62	0	10	12	0
9	0	16	13	15	16	22	22	0.61	7.9	14	10	0
10	0	16	14	16	15	23	16	0.57	16	13	10	0
11	0	16	14	16	16	20	17	0.52	16	13	12	0
12	0	16	15	16	16	19	17	0.52	16	14	14	0
13	0	16	16	16	16	18	18	0.45	15	15	12	0
14	0	16	17	16	16	17	24	0.43	15	6.5	10	0
15	0	16	17	15	16	17	23	0.43	15	0.81	5.6	0
16	0	17	17	15	16	16	19	0.43	16	0.23	0.88	0
17	0	17	17	15	16	16	19	0.43	15	0.05	0.11	4.6
18	0	17	17	15	17	16	18	0.43	14	0	0	8.5
19	0	17	16	16	17	16	18	0.43	13	0	0	8.4
20	0	17	15	16	15	16	17	0.35	13	0	0	7.4
21	0	17	15	16	15	17	17	0.69	5.3	0	0	5.2
22	0	17	15	16	15	16	20	0.05	0.35	0	0	4.3
23	0	17	15	16	15	16	16	0	0.06	0	0	4.6
24	0	17	14	17	17	16	16	0	0	0	0	4.1
25	0	17	14	16	17	16	16	0	0	0	0	3.5
26	0	17	15	16	17	16	16	0	0	0	1	3.1
27	0	16	15	15	18	16	16	0	0	0	1.3	4.7
28	0	16	15	14	18	18	16	0	0	0	0.43	6.6
29	0	17	16	14	---	18	16	0	0	0	0.09	5.7
30	0	17	16	15	---	17	16	3.3	0	0	0.01	5.4
31	3.6	---	16	15	---	17	---	4.6	---	0	0	---
TOTAL	3.72	501	470	478	451	543	588	41.71	179.84	86.59	128.02	76.10
MEAN	0.12	16.7	15.2	15.4	16.1	17.5	19.6	1.35	5.99	2.79	4.13	2.54
AC-FT	7.4	994	932	948	895	1080	1170	83	357	172	254	151
MAX	3.6	17	17	17	18	23	36	16	16	15	17	8.5
MIN	0	16	13	14	15	16	16	0	0	0	0	0
CAL YR	2009	TOTAL	3230.91	MEAN	8.85	MAX	28	MIN	0	AC-FT	6410	
WTR YR	2010	TOTAL	3546.98	MEAN	9.72	MAX	36	MIN	0	AC-FT	7040	

MAX DISCH: 42 CFS AT 11:45 ON Apr. 07,2010 GH 1.42 FT. SHIFT 0 FT. (GH CORR. OF -0.02 FT APPLIED)

MAX GH: 1.42 FT. AT 11:45 ON Apr. 07,2010 (GH CORR. OF -0.02 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C
Water Year 2010

Location.-- Combined record from Purgatoire River at Ninemile Dam and Ninemile Canal below Ninemile Dam gages both located at Lat 37°42'53", long 103°30'38", in NW $\frac{1}{4}$ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon.

Drainage and Period of Record.-- 2,752 mi².

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.--

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- The combined record of discharges was obtained by the addition of daily flows from the Ninemile Canal to the corresponding daily flows in the Purgatoire River at Ninemile Dam. Mean daily discharge was estimated on the following days: December 3-31, 2009; January 1-10, 15-21, 25-31, 2010; and February 1-2, 8-11, 20-25, 2010, due to ice. The peak unit value combined discharge for the year was 1530 cfs at 0700 on April 22, 2010.

Special Computations.--

Remarks.-- Combined record is fair, except record should be considered poor during periods of estimated flow and during periods where discharge in the river exceeds 500 cfs, above which the rating has not been verified by measurements. See individual records for more details. Record developed by Div. 2 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

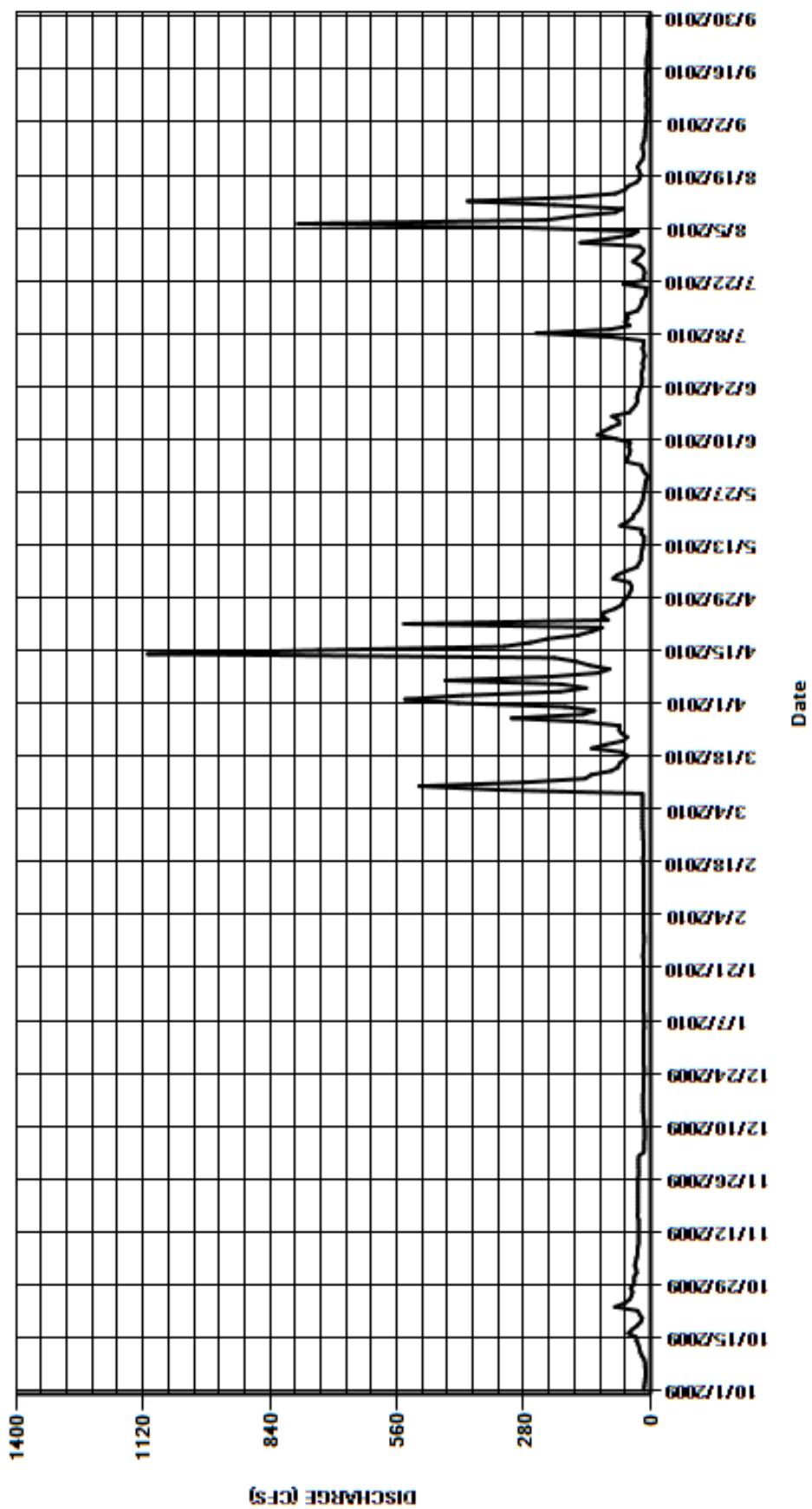
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	31	27	16	15	18	425	43	13	16	155	11
2	14	32	26	16	16	18	542	42	18	13	94	10
3	13	35	15	16	16	18	415	47	20	15	43	9.8
4	12	33	14	16	16	18	200	83	56	18	28	9.4
5	11	31	14	14	16	18	142	73	51	15	286	8.1
6	11	29	14	15	16	18	197	54	47	15	778	9.6
7	12	29	13	14	16	18	453	31	45	45	231	9
8	12	28	13	14	16	18	222	26	49	252	168	7.9
9	14	26	13	15	16	337	115	21	45	91	78	10
10	19	26	14	16	15	511	91	21	76	46	61	9.7
11	23	26	14	16	16	277	135	20	117	57	212	9.2
12	25	26	15	16	16	144	164	18	104	50	404	10
13	27	26	16	16	16	131	213	16	88	53	179	10
14	31	26	17	16	16	87	1110	14	69	29	78	11
15	32	26	17	15	16	72	733	14	71	23	57	9.5
16	49	29	17	15	16	69	323	21	85	20	49	6.9
17	41	28	17	15	16	58	266	19	47	18	31	8.5
18	30	28	17	15	17	51	229	67	40	11	24	8.5
19	22	28	16	16	17	64	160	52	33	10	22	8.4
20	19	28	15	16	15	130	130	40	29	8.4	25	7.4
21	24	28	15	16	15	99	107	37	30	60	29	5.2
22	29	28	15	16	15	60	544	28	28	14	25	4.3
23	79	28	15	16	15	52	94	24	25	15	18	4.6
24	57	28	14	17	17	65	107	20	20	13	16	4.1
25	46	28	14	16	17	70	103	17	19	15	16	3.5
26	42	28	15	16	17	68	79	16	19	23	18	3.1
27	40	26	15	15	18	142	64	14	20	39	18	4.7
28	44	26	15	14	18	307	60	13	19	28	14	6.6
29	37	27	16	14	---	149	52	12	16	19	13	5.7
30	36	27	16	15	---	124	47	10	18	15	12	5.4
31	36	---	16	15	---	189	---	5.8	---	24	12	---
TOTAL	901	845	490	478	451	3400	7522	918.8	1317	1110.4	3194	231.1
MEAN	29.1	28.2	15.8	15.4	16.1	110	251	29.6	43.9	35.8	103	7.7
AC-FT	1790	1680	972	948	895	6740	14920	1820	2610	2200	6340	458
MAX	79	35	27	17	18	511	1110	83	117	252	778	11
MIN	11	26	13	14	15	18	47	5.8	13	8.4	12	3.1
CAL YR	2009	TOTAL	10151.2	MEAN	27.8	MAX	746	MIN	1.7	AC-FT	20130	
WTR YR	2010	TOTAL	20858.3	MEAN	57.1	MAX	1110	MIN	3.1	AC-FT	41370	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER AT NINE MILE DAM, NEAR HIGBEE (C)
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
Water Year 2010

Location.--	Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage and Period of Record.--	3253.14 sq.mi.
Equipment.--	Sutron Constant Flow Bubbler water level sensor and satellite-monitored high data rate data collection platform in a 4 ft x 4 ft steel shelter. Primary reference gage is a drop tape gage referenced to the top of "C" channel attached to face of concrete flood block on left channel bank holding bubbler orifice line. No changes this water year.
Hydrologic Conditions.--	The Purgatoire River below Highland Dam has a drainage basin of approximately 3320 square miles. Characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: December 5-12, 16-31, 2009, January 1-21, 27-31, February 1-15, 20-23, 2010, when the stage-discharge relationship was affected by ice on the control; and, September 16-30, 2010, when gage heights were affected by a downstream beaver dam. Short periods of missing unit value satellite data were filled in without loss of accuracy on the following dates: March 17, April 8, August 3-5, 25-27, 2010. Data were filled in using trends in adjacent data given the short time periods and gage height stability or using the DCP log when available without loss of accuracy. Primary stage sensor calibration to reference gage is supported by 15 visits made this water year. Based on these visits, the following corrections were applied to the gage height record: Oct 1-5, 2009, prorated from -0.04 to -0.05 ft correction; October 27, 2009 – January 8, 2010, prorated from 0.00 to -0.05 ft correction. A site visit log was not available to assist in the determination of gage height corrections this water year.
Datum Corrections.--	Levels were last run August 22, 2008 to the water surface and the drop tape RP using RM No. 1 as base. No corrections were required.
Rating.--	The control at low to medium flows (up to 500 cfs) is the primary channel with silt, sand, gravel and cobble bed and earthen banks. Bank vegetation of variable density in secondary overbank areas (primarily left side) affects flows above 500 cfs considerably. Rating No. 3, dated October 1, 2003 was used for the entire water year. It is well-defined to approximately 500 cfs, which is considered to be the primary channel capacity. Above 500 cfs, flow spills out of the channel and the control changes – this portion of the rating is based on a channel survey. Fifteen discharge measurements (Nos. 156 – 170) were made during the water year. Measured discharge ranged from 0.00 to 84.8 cfs. Measurements cover the range in stage experienced except for the following higher flow days: March 8-15, 20-31; April 1-28; May 5, 16; June 11-14, 16; July 8-10; August 1-2, 6-14, 2010. The peak discharge of 2410 cfs occurred at 1030 on April 15, 2010 at a gage height of 7.39 ft with a shift of -0.17 ft. It exceeded the stage of maximum flow measurement for the water year (No. 161 made on April 28, 2010) by 4.79 ft.
Discharge.--	Shifting control method was used for the entire water year. The shift versus gage height scatter shows a general trend toward more negative shifts at higher gage heights. Shift curve PURHILCOSC1 was developed from this trend. Shifts were distributed throughout the water year using the following methods: time prorated from 0000 October 1, 2009 through 1459 October 5, 2009 in an effort to transition to this water year. distributed by stage using PURHILCOSC1 1500 October 5, 2009 through 1445 September 16, 2010. Time proration 1500 September 16, 2010 through 1010 September 30, 2010 to emulate the start of the beaver dam affect. Flow during this period was near zero. Time proration from 1100 September 30, 2010 to 0000 October 1, 2010 to emulate the beaver dam affect. Flow during this period was near zero. Open water measurements showed shifts varying between -0.02 to -0.81 feet. All open water measurements were given full weight except for Measurements 156, 157, 160, 163-167, 169, which were discounted from -8% to +7% for smoothing purposes. Measurement 159 was affected by 100% ice cover and not used. Measurement 170 was affected by backwater from a beaver dam downstream and not used.
Special Computations.--	Discharges during ice-affected periods were determined by examination of Las Animas NOAA air temperature data, trned in gage height before, during and after ice affected periods, and comparison with flows at upstream gage Purgatoire River at Ninemile Dam. Missing data was replaced in most cases with DCP log data. On days when the log data was also missing, the missing unit values ranged from a single 15-minute period to seven 15-minute periods. Since the periods were short and the gage height was relatively stable, linear interpolation was performed between two adjacent values.

Remarks.--

Record fair, except during periods when flows were estimated and when flows exceed 500 cfs, since such flows are unmeasurable at this location, which should be considered poor. Station maintained by Adam Adame and record developed by Charlie DiDomenico.

Recommendations.--

High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway.

STATE OF COLORADO
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PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS

RATING TABLE--

PURHILCO03 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

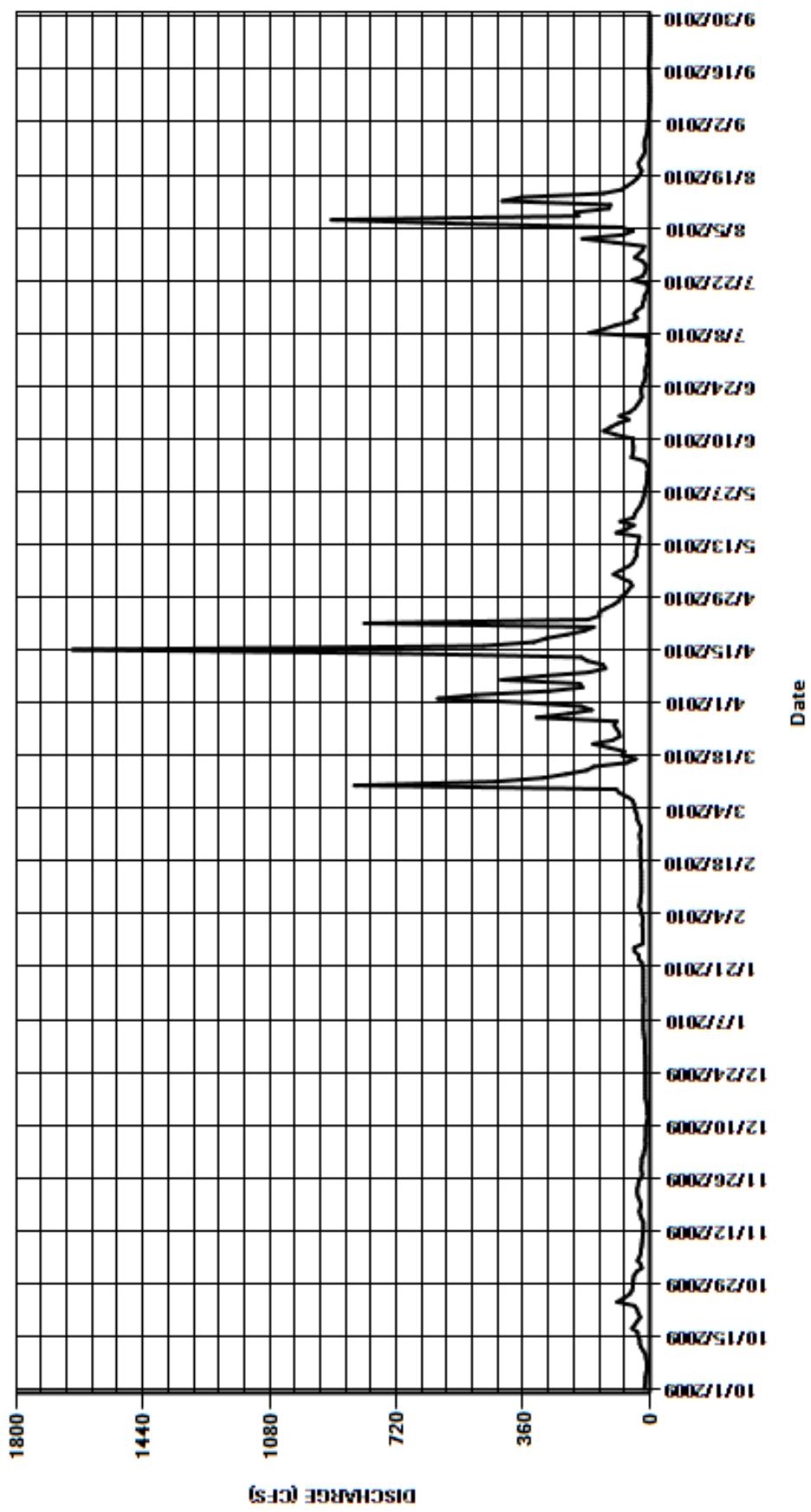
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	38	23	14	22	36	363	60	7.3	5.9	101	5.8
2	14	23	18	16	20	36	602	50	4	8.5	192	4.9
3	13	26	16	17	20	40	495	57	8.9	5.1	76	3.6
4	13	35	13	18	24	43	285	80	15	3.4	48	2.9
5	11	29	12	18	26	45	191	103	52	9.8	79	2.5
6	9.1	26	13	18	30	49	199	84	48	7	557	1.7
7	8.5	25	12	18	28	64	422	63	47	5.9	904	0.91
8	8.9	23	12	18	27	86	307	48	47	172	203	0.44
9	11	22	12	18	25	96	173	44	49	131	212	1.1
10	12	21	10	18	24	839	126	37	47	98	116	0.67
11	18	20	8	18	24	439	133	39	97	58	112	0.52
12	25	18	5	17	24	302	178	36	131	36	419	1.1
13	29	18	7.8	18	24	238	195	34	111	45	363	0.88
14	29	18	6.6	18	24	179	708	31	91	36	132	1.5
15	34	23	9	18	24	159	1640	30	60	21	80	2.6
16	35	27	10	18	25	66	473	95	86	20	64	4.1
17	51	30	13	18	26	40	330	67	57	15	48	3.4
18	42	27	13	18	24	80	295	45	43	15	36	2.3
19	35	26	13	18	27	72	236	84	35	6.9	28	1.6
20	27	29	13	18	27	115	186	46	28	5	23	0.64
21	33	34	13	20	28	161	159	43	22	8.4	29	0.06
22	36	36	13	23	27	105	811	36	24	50	33	0.02
23	44	36	13	32	26	85	176	28	25	21	26	0.03
24	93	33	13	32	28	87	143	23	21	15	19	0.03
25	74	32	13	44	29	95	143	19	17	11	14	0.1
26	58	23	13	44	26	102	124	16	13	11	15	0.25
27	51	22	13	20	25	94	102	15	11	20	15	0.23
28	48	24	13	20	31	322	87	12	14	43	15	0.26
29	48	24	14	20	---	232	82	9.3	11	31	11	0.16
30	47	23	14	20	---	165	68	8	7.9	20	8.3	0.14
31	45	---	14	20	---	196	---	7.4	---	16	6.8	---
TOTAL	1018.5	791	385.4	647	715	4668	9432	1349.7	1230.1	950.9	3985.1	44.44
MEAN	32.9	26.4	12.4	20.9	25.5	151	314	43.5	41	30.7	129	1.48
AC-FT	2020	1570	764	1280	1420	9260	18710	2680	2440	1890	7900	88
MAX	93	38	23	44	31	839	1640	103	131	172	904	5.8
MIN	8.5	18	5	14	20	36	68	7.4	4	3.4	6.8	0.02
CAL YR	2009	TOTAL	10492.55	MEAN	28.7	MAX	910	MIN	0	AC-FT	20810	
WTR YR	2010	TOTAL	25217.14	MEAN	69.1	MAX	1640	MIN	0.02	AC-FT	50020	

MAX DISCH: 2410 CFS AT 10:30 ON Apr. 15,2010 GH 7.39 FT. SHIFT -0.17 FT.

MAX GH: 7.39 FT. AT 10:30 ON Apr. 15,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN

HIGHLAND CANAL

Water Year 2010

Location.--	Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage and Period of Record.--	N/A
Equipment.--	Float-activated graphic water-stage recorder and shaft encoder in small shelter over CMP stilling well. Shaft encoder wired to satellite-monitored data collection platform (Sutron 8210 HDR DCP) located in Purgatoire River below Highland Dam gage shelter. Standard 5-ft steel Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. Sutron 8210 DCP replaced on August 5, 2010.
Hydrologic Conditions.--	The Highland Canal diverts water from the Purgatoire River which has a drainage basin of approximately 2623 square miles. Purgatoire River basin characteristics include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the graphic chart record and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage. The chart was relied upon without loss of accuracy during the periods: August 4-6, 2010 when the 8210 was replaced and the canal shaft encoder was not reset.; and, August 26-27, 2010 when satellite data was missing periodically.
Datum Corrections.--	Levels were last run to the flume on August 5, 2003. No corrections needed.
Rating.--	The control is a standard, 5-foot, steel Parshall flume. A standard 5-ft Parshall flume rating table, in use since May 23, 2001 was used during the entire water year. There was one discharge measurement made (# 4 made on June 23, 2010, 0.00 shift) this year. The peak discharge of 7.52 cfs occurred at 0845 on June 13, 2010, at a gage height of 0.54 ft with a shift of 0.00 ft. It exceeded the stage of the measurement 4 by 0.19 ft.
Discharge.--	Shifting control method was used for the entire water year. The shift of 0.00 ft was applied for the entire water year.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	Record is good. Station maintained and record developed by Adam Adame.
Recommendations.--	A levels survey and flume inspection before water year 2011 season.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HIGHLAND CANAL

RATING TABLE--

STD05FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	2.2	3.9	3.7	3.8	3.6
2	0	0	0	0	0	0	0	3.9	3.8	3.7	3.8	3.6
3	0	0	0	0	0	0	0	2.8	3.8	3.7	3.7	3.6
4	0	0	0	0	0	0	0	3.3	3.7	3.8	3.8	3.6
5	0	0	0	0	0	0	0	3.8	4.2	4	3.7	3.7
6	0	0	0	0	0	0	0	3.7	4	4.1	4.2	3.9
7	0	0	0	0	0	0	0	3.7	4	4.2	4	3.8
8	0	0	0	0	0	0	0	3.6	4	5	3.6	3.7
9	0	0	0	0	0	0	0	3.6	4	3.9	3.9	4.2
10	0	0	0	0	0	0	0	3.7	3.9	4.1	3.7	4.1
11	0	0	0	0	0	0	0	3.8	3.9	3.8	3.6	4.1
12	0	0	0	0	0	0	0	3.8	3.4	3.7	3.6	3.9
13	0	0	0	0	0	0	0	3.8	3.8	3.7	3.5	3.6
14	0	0	0	0	0	0	0	3.8	3.7	3.7	3.5	3.6
15	0	0	0	0	0	0	0	3.8	3.7	3.6	3.5	1.3
16	0	0	0	0	0	0	0	3.8	3.9	3.6	3.7	0
17	0	0	0	0	0	0	0	3.4	3.8	3.8	3.6	0
18	0	0	0	0	0	0	0	3.4	3.8	4.2	3.5	0
19	0	0	0	0	0	0	0	3.7	3.8	4	3.6	0
20	0	0	0	0	0	0	0	3.5	3.7	3.9	3.7	0
21	0	0	0	0	0	0	0	3.5	3.6	3.9	3.9	0
22	0	0	0	0	0	0	0	3.7	3.8	4.6	3.7	0
23	0	0	0	0	0	0	0	3.8	3.8	4.1	3.4	0
24	0	0	0	0	0	0	0	3.6	3.8	3.7	3.3	0
25	0	0	0	0	0	0	0	3.6	3.7	3.8	3.3	0
26	0	0	0	0	0	0	0	3.6	3.6	3.8	3.4	0
27	0	0	0	0	0	0	0	3.6	3.5	3.8	3.5	0
28	0	0	0	0	0	0	0	3.6	3.5	3.8	3.5	0
29	0	0	0	0	---	0	0	3.5	3.6	3.8	3.5	0
30	0	0	0	0	---	0	0	3.6	3.7	3.8	3.6	0
31	0	---	0	0	---	0	---	3.7	---	3.7	3.6	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110.9	113.4	121.0	112.7	54.30
MEAN	0	0	0	0	0	0	0	3.58	3.78	3.9	3.64	1.81
AC-FT	0	0	0	0	0	0	0	220	225	240	224	108
MAX	0	0	0	0	0	0	0	3.9	4.2	5	4.2	4.2
MIN	0	0	0	0	0	0	0	2.2	3.4	3.6	3.3	0

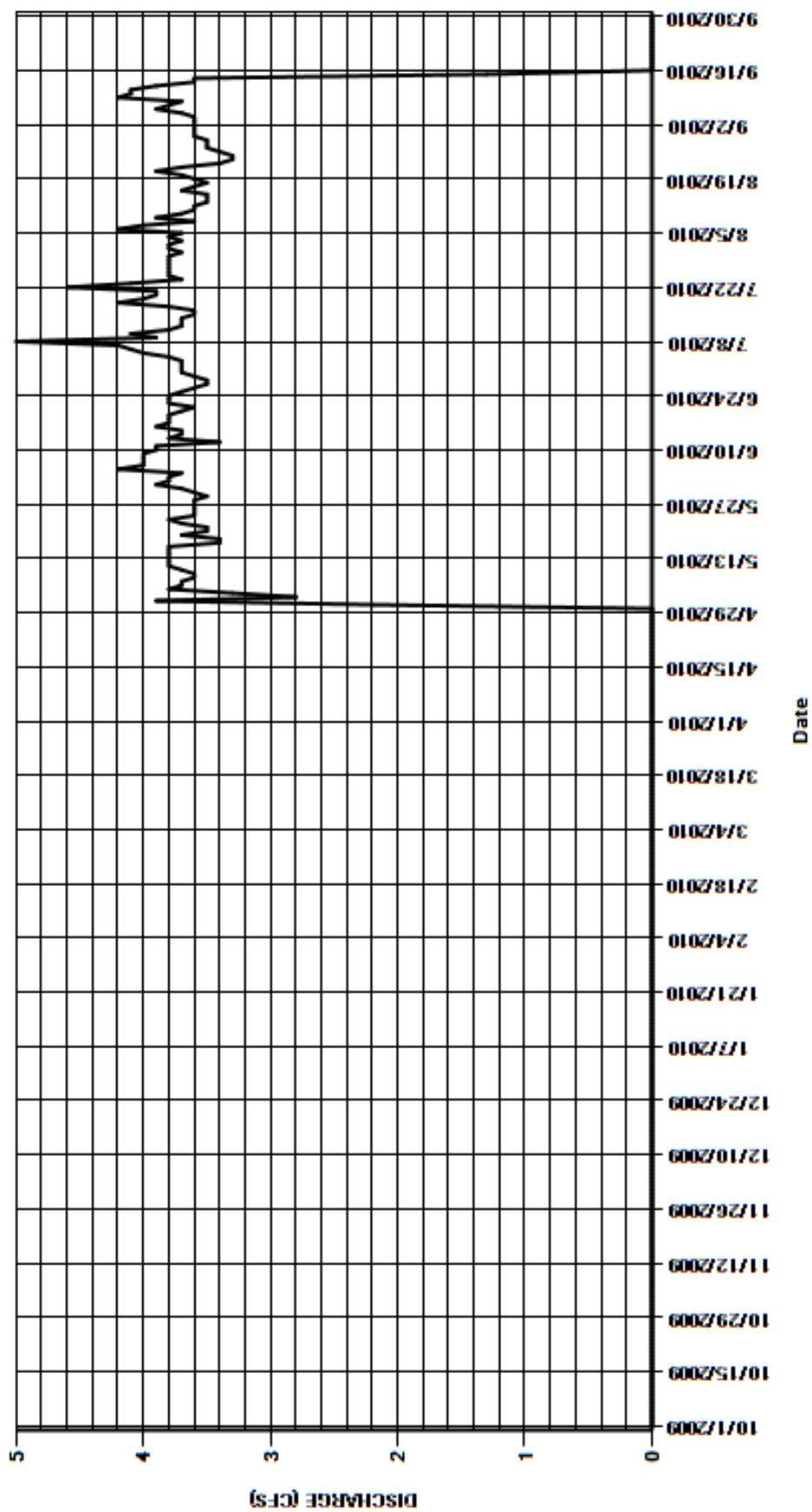
CAL YR	2009	TOTAL	476.70	MEAN	1.31	MAX	11	MIN	0	AC-FT	946
WTR YR	2010	TOTAL	512.30	MEAN	1.4	MAX	5	MIN	0	AC-FT	1020

MAX DISCH: 7.52 CFS AT 08:45 ON Jun. 13,2010 GH 0.54 FT. SHIFT 0 FT.

MAX GH: 0.54 FT. AT 08:45 ON Jun. 13,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HIGHLAND CANAL
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA
Water Year 2010

Location.--	Combined record from Purgatoire River below Highland Dam and Highland Canal below Highland Dam gages located Lat 37°54'03", Long 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately 1/4 mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage and Period of Record.--	N/A.
Equipment.--	See individual records for gage equipment descriptions.
Hydrologic Conditions.--	
Gage-Height Record.--	See individual station analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	The combined record of discharges was obtained by the addition of Highland Canal daily flows to the corresponding daily flows in the Purgatoire River below Highland Dam. Mean daily discharge was estimated on the following days: December 5 -12, 16-31, 2009, January 1-21, 27-31, February 1-15, 20-23, 2010, when the stage-discharge relationship was affected by ice on the control; and, September 16-30, 2010, when gage heights were affected by a downstream beaver dam. The peak unit value combined discharge for the water year was 2410 cfs at 10:30 on April 15, 2010.
Special Computations.--	
Remarks.--	Combined record is fair, except during periods of estimated flow and flows greater than 500 cfs, which should be considered poor. See individual station analyses for the two gages for more details. Record developed by Div. 2 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	38	23	14	22	36	363	62	11	9.6	105	9.4
2	14	23	18	16	20	36	602	54	7.8	12	196	8.5
3	13	26	16	17	20	40	495	60	13	8.8	80	7.2
4	13	35	13	18	24	43	285	83	19	7.2	52	6.5
5	11	29	12	18	26	45	191	107	56	14	83	6.2
6	9.1	26	13	18	30	49	199	88	52	11	561	5.6
7	8.5	25	12	18	28	64	422	67	51	10	908	4.7
8	8.9	23	12	18	27	86	307	52	51	177	207	4.1
9	11	22	12	18	25	96	173	48	53	135	216	5.3
10	12	21	10	18	24	839	126	41	51	102	120	4.8
11	18	20	8	18	24	439	133	43	101	62	116	4.6
12	25	18	5	17	24	302	178	40	134	40	423	5
13	29	18	7.8	18	24	238	195	38	115	49	367	4.5
14	29	18	6.6	18	24	179	708	35	95	40	136	5.1
15	34	23	9	18	24	159	1640	34	64	25	84	3.9
16	35	27	10	18	25	66	473	99	90	24	68	4.1
17	51	30	13	18	26	40	330	70	61	19	52	3.4
18	42	27	13	18	24	80	295	48	47	19	40	2.3
19	35	26	13	18	27	72	236	88	39	11	32	1.6
20	27	29	13	18	27	115	186	50	32	8.9	27	0.64
21	33	34	13	20	28	161	159	47	26	12	33	0.06
22	36	36	13	23	27	105	811	40	28	55	37	0.02
23	44	36	13	32	26	85	176	32	29	25	29	0.03
24	93	33	13	32	28	87	143	27	25	19	22	0.03
25	74	32	13	44	29	95	143	23	21	15	17	0.1
26	58	23	13	44	26	102	124	20	17	15	18	0.25
27	51	22	13	20	25	94	102	19	15	24	19	0.23
28	48	24	13	20	31	322	87	16	18	47	19	0.26
29	48	24	14	20	---	232	82	13	15	35	15	0.16
30	47	23	14	20	---	165	68	12	12	24	12	0.14
31	45	---	14	20	---	196	---	11	---	20	10	---
TOTAL	1018.5	791	385.4	647	715	4668	9432	1467	1348.8	1075.5	4104	98.72
MEAN	32.9	26.4	12.4	20.9	25.5	151	314	47.3	45	34.7	132	3.29
AC-FT	2020	1570	764	1280	1420	9260	18710	2910	2680	2130	8140	196
MAX	93	38	23	44	31	839	1640	107	134	177	908	9.4
MIN	8.5	18	5	14	20	36	68	11	7.8	7.2	10	0.02

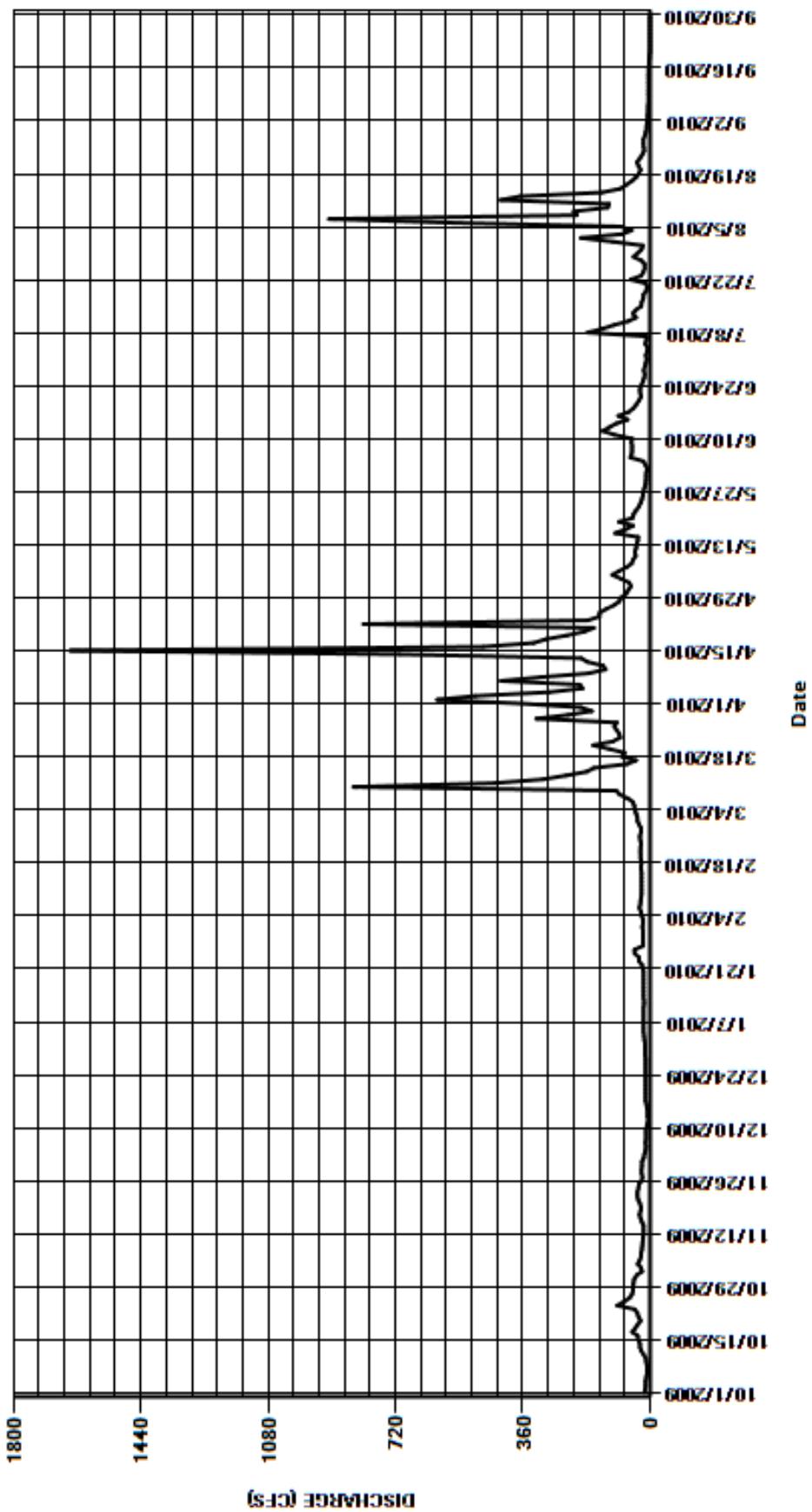
CAL YR	2009	TOTAL	10988.4	MEAN	30.1	MAX	914	MIN	1.7	AC-FT	21800
WTR YR	2010	TOTAL	25750.92	MEAN	70.6	MAX	1640	MIN	0.02	AC-FT	51080

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO
Water Year 2010

Location.--	Lat. 37°45'46", Long. 103°14'36" (Toonerville, Colorado quadrangle, 1:24000 scale) in the SE 1/4 SE 1/4 Sec.21, T26S, R52W, Bent County on the north bridge abutment at the crossing of CR 11 and Muddy Creek.
Drainage and Period of Record.--	166.95 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004 utilizing the existing stilling well.
Equipment.--	High data rate Sutron SatLink Logger and shaft encoder in a steel "half shelter" mounted on top of a 24-inch corrugated metal stilling well. Shaft encoder is referenced to a drop tape from an "I" beam on the downstream side of a bridge rail. Precipitation recorded with a tipping bucket gage. No changes this water year.
Hydrologic Conditions.--	The Muddy Creek gaging station has a drainage basin of approximately 154 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime. No hydrologic condition changes this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored data with DCP log backup. Record is complete and reliable. Missing unit values on January 23; February 27; August 11; September 23, 2010 were replaced by linear interpolation of adjacent data without loss of accuracy due to stable gage heights.
Datum Corrections.--	Levels were not run this water year. Levels were last run April 8, 2005 to establish gage datum and point of zero flow.
Rating.--	The control at low and medium flows is the sand and mud channel along with vegetation in the channel. Control at higher stages includes the creek banks and brush lining the edges of the channel. Flows are contained by the bridge immediately upstream of the gage. Rating No. 3 dated June 17, 2010 was used for entire water year after analysis of Rating No. 1 and measured flows showed that a new rating curve was needed. Rating No. 3 was developed from analysis of HEC-RAS modeling and field measurements. The decision to use Rating No. 3 the entire water year is based on the no flow observations prior to its implementation. Thirteen discharge measurements were made this water year – eleven with observations of zero flow, one with a trace observation and one (No. 45) with measured flow of 8.42 cfs. The peak flow of 242 cfs occurred at 0330 July 8, 2010 at gage height of 5.35 feet with a shift of -0.08 ft. The peak exceeded the stage of maximum measurement no. 45 made Jul 8, 2010 by 2.80 ft.
Discharge.--	Shifting control method was used for the entire water year. Measurement 45 shift of -0.08 ft, Rating No. 3 and a point of zero flow at 1.70 feet were used to produce the discharge record. Hourly average gage heights were less than 1.70 ft for the following periods: 0000 Oct 1-0600 Oct 22, 0000 Oct 23-1900 Oct 25, 1500 Oct 26-0100 Oct 31, 0800 Oct 31-0500 Mar 9, 2100 Mar 9-0500 Mar 26, 0000 Mar 28-1200 Jul 7, 0900 Jul 9-2100 Jul 20, 1300 Jul 21-1400 Aug 1, 0300 Aug 2-0300 Aug 6, 1700 Aug 6 – 2300 Sep 30. A discharge of 0.00 cfs was assigned to these periods. Flow events due to rainfall runoff were recorded at the gage for the following periods when hourly average gage heights exceeded 1.70 ft: 0700-2300 Oct 22, 2000 Oct 25-1400 Oct 26, 0200-0600 Oct 31, 0600-2000 Mar 9, 0600 Mar 26- 2300 Mar 27, 1300 Jul 7- 0800 Jul 9, 2200 Jul 20-1200 Jul 21, 1500 Aug 1-0200 Aug 2, 0400-1600 Aug 6. Discharge for these periods was computed using a shift of -0.08 ft.
Special Computations.--	None.
Remarks.--	Overall, the record during periods of zero flow is good, but the record during periods of flow is poor. The flashy nature and remote location of the gage make it extremely difficult maintain an accurate stage-discharge rating. Station maintained by Adam Adame and record developed by C.DiDomenico and T. Ley.
Recommendations.--	

STATE OF COLORADO
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MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO

RATING TABLE--

MUDTOOCO003 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0.16	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0.04	0
7	0	0	0	0	0	0	0	0	0	2.1	0	0
8	0	0	0	0	0	0	0	0	0	32	0	0
9	0	0	0	0	0	0.76	0	0	0	0.01	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0.41	0	0
21	0	0	0	0	0	0	0	0	0	1.5	0	0
22	0.43	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0.24	0	0	0	0	0	0	0	0	0	0	0
26	0.29	0	0	0	0	1.3	0	0	0	0	0	0
27	0	0	0	0	0	0.47	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.96	0.00	0.00	0.00	0.00	2.53	0.00	0.00	0.00	36.02	0.20	0.00
MEAN	0.031	0	0	0	0	0.082	0	0	0	1.16	0.006	0
AC-FT	1.9	0	0	0	0	5	0	0	0	71	0.4	0
MAX	0.43	0	0	0	0	1.3	0	0	0	32	0.16	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

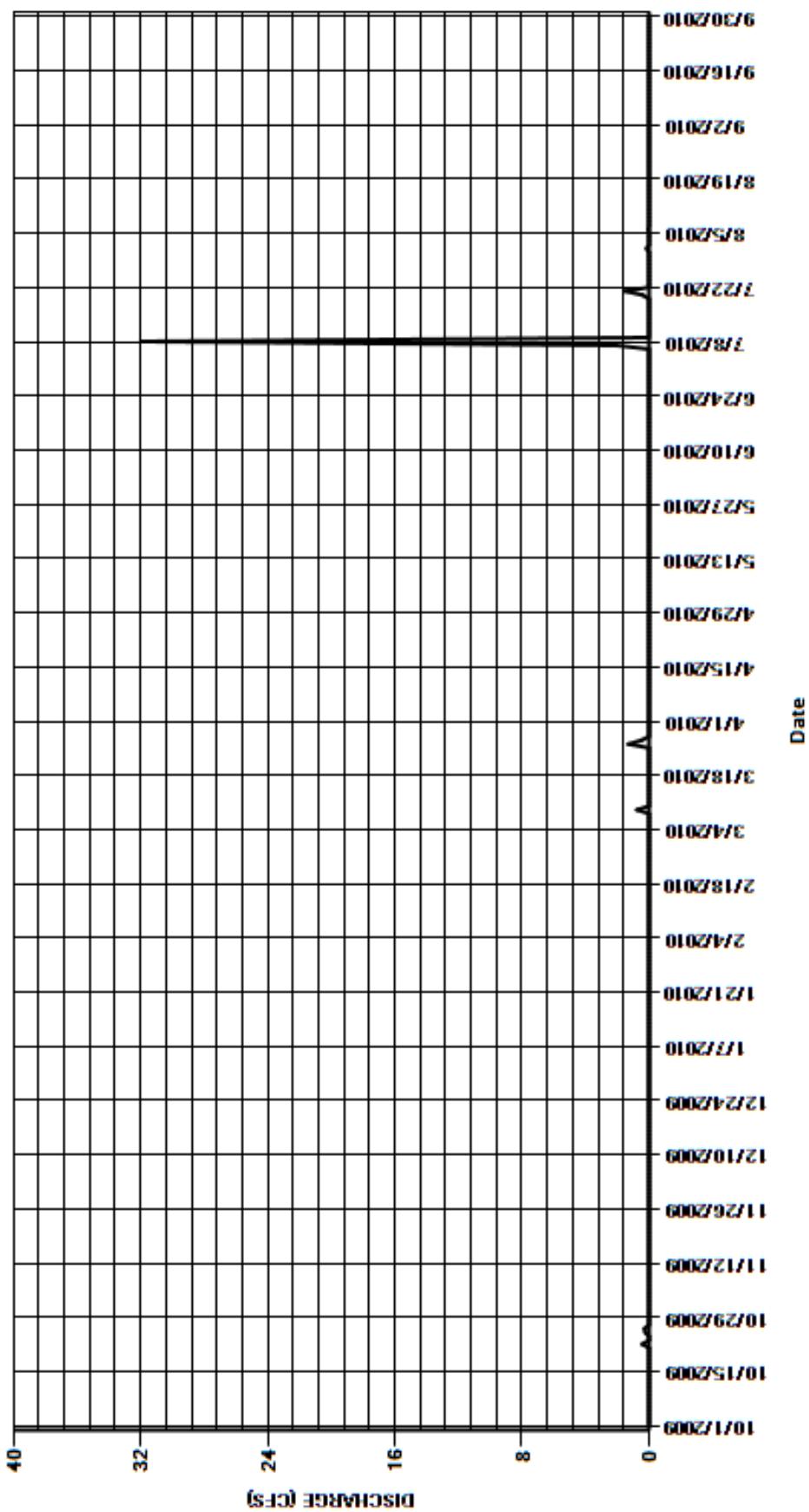
CAL YR	2009	TOTAL	184.88	MEAN	0.51	MAX	69	MIN	0	AC-FT	367	
WTR YR	2010	TOTAL	39.71	MEAN	0.11	MAX	32	MIN	0	AC-FT	79	

MAX DISCH: 242 CFS AT 03:30 ON Jul. 08,2010 GH 5.35 FT. SHIFT -0.08 FT.

MAX GH: 5.35 FT. AT 03:30 ON Jul. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK BELOW MUDY CR DAM NR TOONERVILLE, CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
Water Year 2010

Location.--	Lat. 37°49'12", Long. 103°10'55" (Toonerville, Colorado quadrangle, 1:24000 scale) in the NW ¼ Sec.6, T26S, R51W, Bent County on the downstream side of a bridge abutment at the crossing of Highway 101 and Rule Creek approximately 920 feet below the confluence of Muddy and Rule Creek.
Drainage and Period of Record.--	196.08 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004 utilizing the existing stilling well.
Equipment.--	High data rate Sutron SatLink Logger DCP and Sutron Accububble mounted inside NEMA type boxes on steel posts on the north side of the Highway 101 bridge over Rule Creek. Primary reference gage is a wire weight gage on the Hwy 101 bridge over the channel on the downstream side. No changes were made this water year.
Hydrologic Conditions.--	The Rule Creek gaging station has a drainage basin of approximately 364 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite-monitored bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: December 9, 2009, when ice in the gage pool caused the bubbler readings to spike; and April 1-21, 2010, when tumbleweeds accumulating in the channel caused backwater at the gage.
Datum Corrections.--	Levels were last run on July 19, 2007. No corrections were needed or made. An abbreviated level loop was run on July 30, 2007, to shoot in the RP for a wire weight reference gage.
Rating.--	Control is a downstream riffle which creates a small pool at the gage. At higher stages the control becomes the channel and includes the brush-lined riverbanks. Flows are contained by the bridge immediately upstream of the gage. Rating No. 2 was developed during the water year on May 17, 2010 and used for the entire water year. It is poorly defined due to a lack of discharge measurements. Fourteen discharge measurements (Nos. 34-47) were made this water year ranging from eleven observations of zero flow and two discharge measurements of 2.27 and 11.6 cfs. The peak discharge of 32.6 cfs occurred at 1015 July 8, 2010 at a gage height of 3.36 ft with a shift of -0.91 ft. It exceeded the stage of Measurement No. 42 made at 1242 July 8, 2010 by 0.40 feet.
Discharge.--	Shifting control method was used for the entire water year. Three variable stage shift relationships were developed using the observations of zero flow and associated measurement shifts, and the two measurements of actual flow. Relatively flat gage heights most of the year bracketed by observations of zero flow were used to help assess zero flow periods, even though there was minor gage height fluctuation in between the observations. Shift curve RULTOOCOSC1, developed using Measurements 34 and 35 was applied from 0000 Oct 1 to 2200 Oct 30 2009. This period included a small event and a measurement of actual flow. Shift curve RULTOOCOSC2, developed using Measurements 36-39 was applied from 2300 Oct 30 2009 to 1200 May 21 2010. A sharp drop in gage height in the afternoon of May 21 was assumed due to channel cleaning. Shift curve RULTOOCOSC3, developed using Measurements 40-47, including measurement of actual flow with Measurement 42 was applied from 1300 May 21 to the end of the water year.
Special Computations.--	Air temperature data was examined using Las Animas NOAA temperature data to assist with winter period ice formation on the gage pool. Discharge and precipitation data from the Muddy Creek near Toonerville gage upstream were used to assist with definition of flow periods. Discharge during the April 1-21 period of backwater was estimated as zero flow using Measurement 38 observation of zero flow and no precipitation and zero flow at the Muddy Creek gage upstream.
Remarks.--	Record is poor for the entire water year, including estimated periods, due to the lack of rating definition and an estimated point of zero flow. The flashy nature and remote location of the gage make it extremely difficult to maintain a reliable stage-discharge relationship. Station maintained by Adam Adame and record developed by C. DiDomenico and T. Ley.
Recommendations.--	Run levels on the control cross section to better establish the point of zero flow. Install a crest stage gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO

RATING TABLE--

RULTOOCO002 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0.02	0	0
8	0	0	0	0	0	0	0	0	0	5.5	0	0
9	0	0	0	0	0	0	0	0	0	1.7	0	0
10	0	0	0	0	0	0	0	0	0	0.14	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0.53	0	0
21	1.5	0	0	0	0	0	0	0	0	2.3	0	0
22	1.2	0	0	0	0	0	0	0	0	0.63	0	0
23	0.26	0	0	0	0	0	0	0	0	0.12	0	0
24	0.07	0	0	0	0	0	0	0	0	0	0	0
25	0.55	0	0	0	0	0	0	0	0	0	0	0
26	0.49	0	0	0	0	0	0	0	0	0	0	0
27	2.3	0	0	0	0	0.81	0	0	0	0	0	0
28	2.1	0	0	0	0	0.1	0	0	0	0	0	0
29	1.4	0	0	0	---	0	0	0	0	0	0	0
30	1.2	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	11.07	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	10.94	0.00	0.00
MEAN	0.36	0	0	0	0	0.029	0	0	0	0.35	0	0
AC-FT	22	0	0	0	0	1.8	0	0	0	22	0	0
MAX	2.3	0	0	0	0	0.81	0	0	0	5.5	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

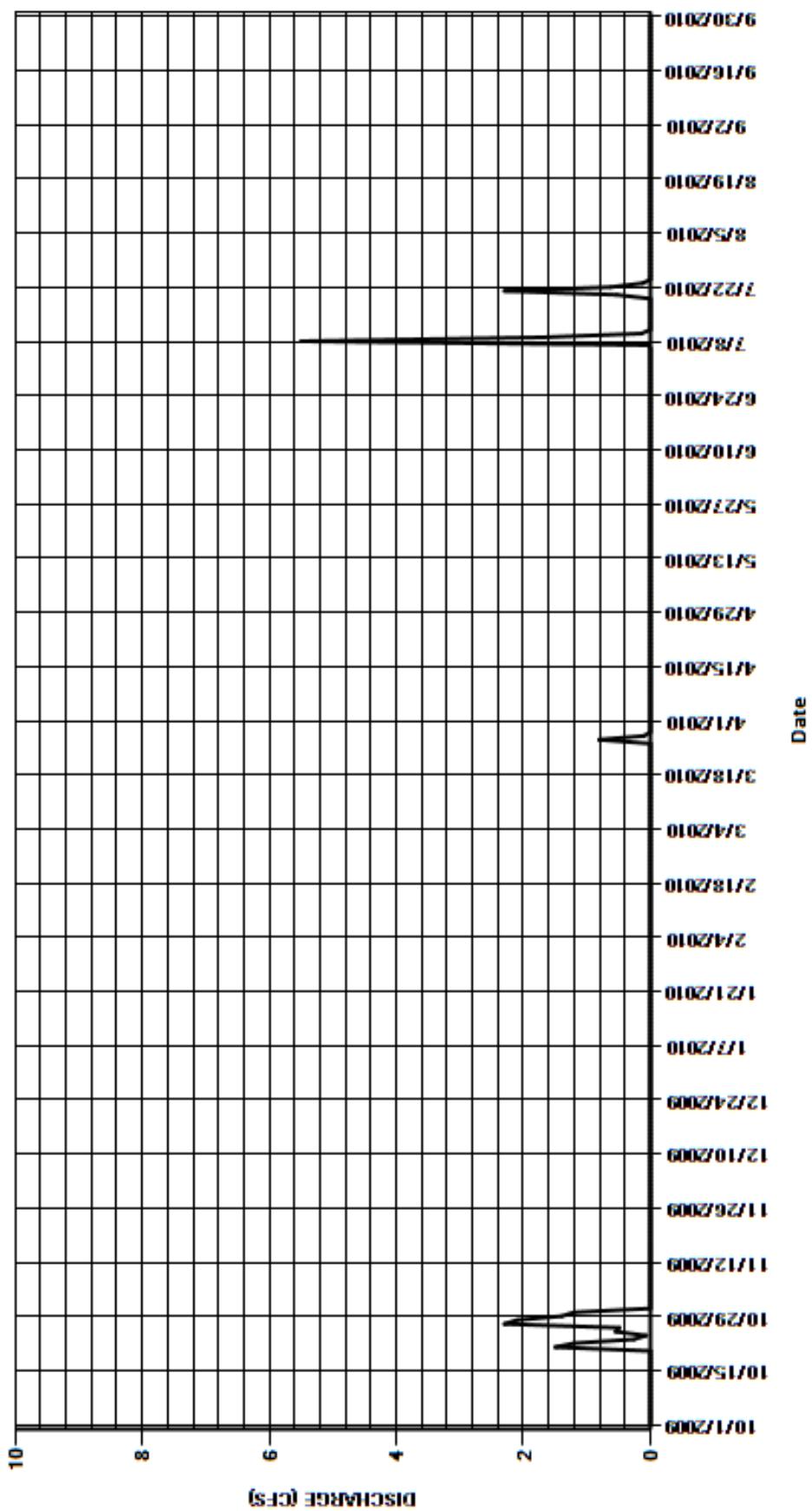
CAL YR	2009	TOTAL	571.05	MEAN	1.56	MAX	325	MIN	0	AC-FT	1130
WTR YR	2010	TOTAL	22.92	MEAN	0.063	MAX	5.5	MIN	0	AC-FT	45

MAX DISCH: 32.6 CFS AT 10:15 ON Jul. 08,2010 GH 3.36 FT. SHIFT -0.91 FT.

MAX GH: 3.36 FT. AT 10:15 ON Jul. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
09061500 COLUMBINE DITCH NEAR FREMONT PASS
Water Year 2010

Location.--	Lat. 39°22'25", Long. 106°13'38". Columbine ditch diverts water from tributaries of Eagle River in sec. 5, T.8 S., R. 79 W., in Colorado River basin to Chalk Creek (tributary to East Fork Arkansas River) in NW ¼ sec. 9, T.8 S., R 79 W., in Arkansas River basin.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot steel Parshall flume.
Hydrologic Conditions.--	– The Columbine Ditch is categorized a transmountain diversion structure which intercepts runoff from a drainage basin of approximately 1170 acres in the headwaters of the Eagle River basin and empties into Chalk Creek, a tributary of the east fork of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable for the seasonally operated gage except for May 24-26, 2010 when ice affected the control.
Datum Corrections.--	Levels were run on July 31, 2007. Levels closed well within allowable limits, so no corrections were needed/taken. The level survey did confirm the floor of the flume slopes toward the staff gage.
Rating.--	A standard, 6 ft. Parshall flume table (COLDITCO01, dated June 22, 1971) was used this water year. Two discharge measurements (Nos. 83-84) ranging from 0 to 6.64 cfs were made this water year. These measurements cover the range in stage for the water year except for the higher daily flows of May 23-June 1, June 4-6, 15-17, 2010. The peak discharge of 42 cfs occurred at 1700 on June 4, 2010 at a gage height of 1.37 ft. with a shift of +0.05 ft. It exceeded Measurement 83 by 0.93 feet in stage.
Discharge.--	Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using a shift curve (COLUMVSHF10A) developed from current and previous water year measurements. This flume does have a considerable amount of lateral settling toward the staff gage and away from the inlet. This is the reasoning for the lower end of the shift curve as the stilling well very seldom drains and retains approx 0.05 ft GH with no flow in the flume. All gage heights between 0.00 and 0.05 are estimated as zero cfs. Measurement 83 was adjusted by -5% for smoothing purposes in the variable shift curve.
Special Computations.--	Variable curve COLUMVSHF10A is considered a valid alternative for calculating flows. As noted above the flume has a considerable amount of lateral settling away from the gage house and inlet, this can be seen while measuring and when flume is empty. All flows below 0.05 ft gage height are considered zero flow. This flume does appear to be stable from historical comments that agree with the current situation. Ice effect was determined using chart data and air temperature data from Turquoise Lake. Ice affected gage height spikes were smoothed using chart data and averages for the day.
Remarks.--	There was a very short run of water this year. Hopefully this gage will have a more constant and predictable run of water to confirm the variable curve but unfortunately the operation of this gage made it very difficult to obtain multiple measurements for this WY. Overall this record is rated good except for the ice effected days on May 24-26, 2010 and during those days the record is considered poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	Depending on the future of this flume it should be recommended the flume be reevaluated to either reinstall the flume or pour a false bottom in the flume to level the floor.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09061500 COLUMBINE DITCH NEAR FREMONT PASS

RATING TABLE--

COLDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	6.2	0	0	0
2	0	0	0	0	0	0	0	0	3.4	0	0	0
3	0	0	0	0	0	0	0	0	4	0	0	0
4	0	0	0	0	0	0	0	0	13	0	0	0
5	0	0	0	0	0	0	0	0	12	0	0	0
6	0	0	0	0	0	0	0	0	10	0	0	0
7	0	0	0	0	0	0	0	0	3.9	0	0	0
8	0	0	0	0	0	0	0	0	0.3	0	0	0
9	0	0	0	0	0	0	0	0	0.25	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	5.5	0	0	0
15	0	0	0	0	0	0	0	0	9.6	0	0	0
16	0	0	0	0	0	0	0	0	9	0	0	0
17	0	0	0	0	0	0	0	0	8.3	0	0	0
18	0	0	0	0	0	0	0	0	4.3	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	2.8	0	0	0
23	0	0	0	0	0	0	0	0	8.9	0	0	0
24	0	0	0	0	0	0	0	0	7.5	0	0	0
25	0	0	0	0	0	0	0	0	7.3	0	0	0
26	0	0	0	0	0	0	0	0	9	0	0	0
27	0	0	0	0	0	0	0	0	18	0	0	0
28	0	0	0	0	0	0	0	0	14	0	0	0
29	0	0	0	0	---	0	0	0	6.9	0	0	0
30	0	0	0	0	---	0	0	0	7.1	0	0	0
31	0	---	0	0	---	0	---	0	6.4	---	0	0
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.90	89.75	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	2.84	2.99	0	0	0
AC-FT	0	0	0	0	0	0	0	174	178	0	0	0
MAX	0	0	0	0	0	0	0	18	13	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

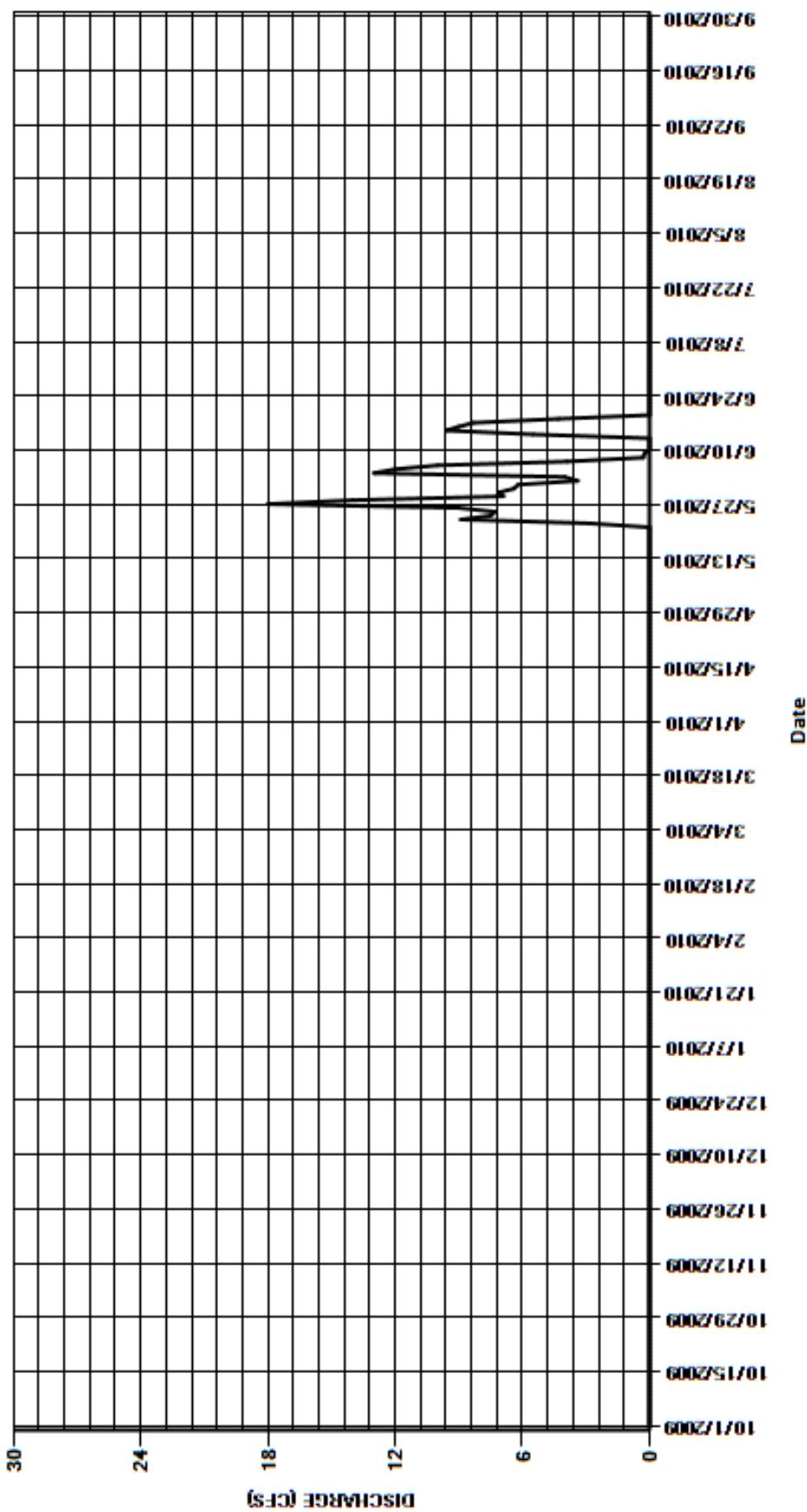
CAL YR	2009	TOTAL	39.21	MEAN	0.11	MAX	4.7	MIN	0	AC-FT	78
WTR YR	2010	TOTAL	177.65	MEAN	0.49	MAX	18	MIN	0	AC-FT	352

MAX DISCH: 42 CFS AT 17:00 ON Jun. 04,2010 GH 1.37 FT. SHIFT 0.05 FT.

MAX GH: 1.37 FT. AT 17:00 ON Jun. 04,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09061500 COLUMBINE DITCH NEAR FREMONT PASS
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
09062000 EWING DITCH AT TENNESSEE PASS
Water Year 2010

Location.-- Lat. 39°21'40", Long. 106°18'22", diverts water from Piney Creek in sec. 11, T.8 S., R.80 W., in Eagle River basin, to Thayer Gulch (tributary to Tennessee Creek) in Sec. 11, T. 8 S., R.80 W., in Arkansas River basin.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 4-foot steel Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Ewing Ditch diverts water from the headwaters of Piney Creek, a tributary of the Eagle River, over Tennessee Pass at an elevation of 10,500 feet, and into the headwaters of Tennessee Creek, a tributary of the Arkansas River. The basin consists primarily of high mountain terrain with very little development. The ditch is approximately 1.5 miles long, and intercepts runoff from a drainage area of 2,400 acres. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. The record is complete and reliable for the seasonally operated gage except for April 22-24, 28 when the gage height was affected by ice, and May 1-3 when the well was frozen. On April 22, 23 the gage was operating but satellite data were not transmitted. Backup chart recorder data were used to fill in missing daily averages without loss of accuracy.

Datum Corrections.-- Levels were last run on July 11, 2006. Level loop closed within established tolerance and no datum corrections made.

Rating.-- A standard 4-ft. Parshall flume table (STD04FTPF dated June 22, 1971) was used this water year. Two discharge measurements (No. 106-107) were made during the year, ranging in discharge from 9.15 to 9.77 cfs. They cover the range in stage except higher flow days of May 28 - June 2, June 5-10, 2010 and lower flow days of April 22 – May 27, June 12 – Sept 30, 2010. The peak discharge of 19.4 cfs occurred at 1900 on May 28, 2010 at a gage height of 1.16 ft with a shift of -0.03 ft. It exceeded the stage of Measurement 107 by 0.40 feet in stage.

Discharge.-- Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using shift curve EWIDITCOVS10 developed from current and previous water years. Measurement #106 was discounted by 2.6% for smoothing purposes in the variable shift curve.

Special Computations.-- Variable Curve EWIDITCOVS10 is considered a valid alternative for calculating flows. Estimated flow of ice affected days was found by averaging the daily spikes. Estimated flows of no gage height caused by the well being frozen were found by using good data surrounding those days. There are no available gages to use as comparison. Temperature data can be used from Turquoise Reservoir with the understanding it is 8.5 miles away and 700 ft lower in elevation.

Remarks.-- Record is considered good, except for periods of ice effect and frozen well, which are estimated and poor. Station maintained and record developed by Cheston Hart.

Recommendations.-- Recommend measuring throughout the running water season to establish a better range in stage. It should also be recommended to have levels ran and a flume inspection performed in 2011 water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09062000 EWING DITCH AT TENNESSEE PASS

RATING TABLE-- STD04FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

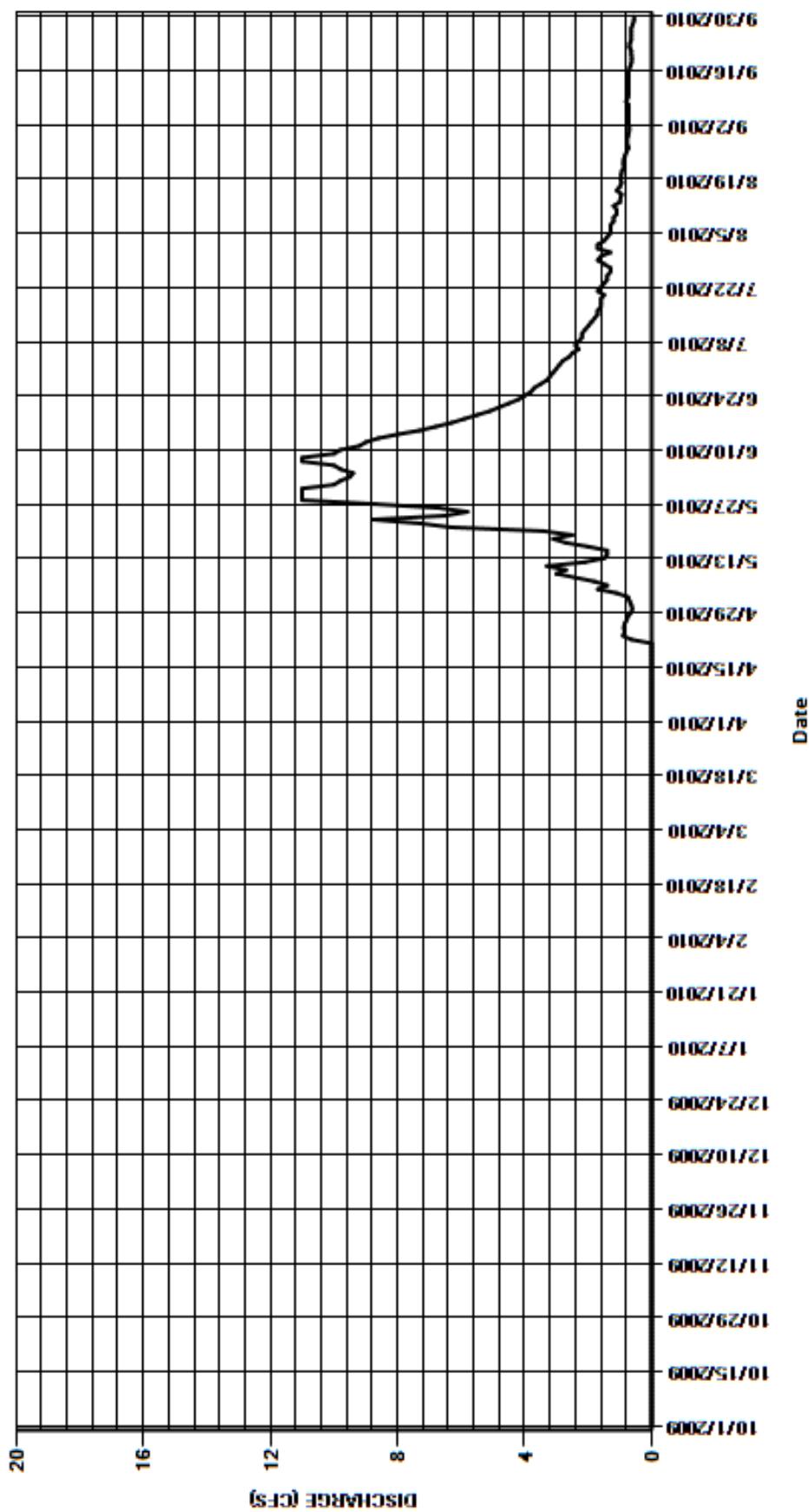
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0.65	10	3	1.7	0.71
2	0	0	0	0	0	0	0	0.7	9.8	2.9	1.7	0.72
3	0	0	0	0	0	0	0	0.75	9.5	2.8	1.5	0.72
4	0	0	0	0	0	0	0	1.1	9.4	2.6	1.4	0.72
5	0	0	0	0	0	0	0	1.7	9.8	2.5	1.3	0.72
6	0	0	0	0	0	0	0	1.4	10	2.3	1.3	0.72
7	0	0	0	0	0	0	0	1.8	11	2.4	1.3	0.72
8	0	0	0	0	0	0	0	2.4	11	2.3	1.2	0.81
9	0	0	0	0	0	0	0	3	10	2.2	1.2	0.75
10	0	0	0	0	0	0	0	2.7	9.8	2.2	1.1	0.72
11	0	0	0	0	0	0	0	3.3	9.2	2.1	1.1	0.72
12	0	0	0	0	0	0	0	2.1	9	2	1.2	0.72
13	0	0	0	0	0	0	0	1.5	8.6	1.9	1	0.72
14	0	0	0	0	0	0	0	1.4	8	1.8	0.99	0.72
15	0	0	0	0	0	0	0	1.4	7.3	1.7	0.95	0.72
16	0	0	0	0	0	0	0	2	6.8	1.7	1.1	0.72
17	0	0	0	0	0	0	0	2.7	6.3	1.6	1	0.68
18	0	0	0	0	0	0	0	3.1	5.9	1.6	0.95	0.64
19	0	0	0	0	0	0	0	2.5	5.5	1.6	0.98	0.63
20	0	0	0	0	0	0	0	3.4	5.1	1.5	0.96	0.64
21	0	0	0	0	0	0	0	6.3	4.8	1.7	0.94	0.64
22	0	0	0	0	0	0	0.65	7.3	4.5	1.6	0.87	0.7
23	0	0	0	0	0	0	0.9	8.8	4.2	1.5	0.89	0.69
24	0	0	0	0	0	0	0.85	6.5	4	1.4	0.88	0.64
25	0	0	0	0	0	0	0.88	5.8	3.8	1.4	0.84	0.64
26	0	0	0	0	0	0	0.86	6.7	3.7	1.3	0.79	0.64
27	0	0	0	0	0	0	0.79	8.7	3.5	1.3	0.73	0.64
28	0	0	0	0	0	0	0.75	11	3.3	1.5	0.77	0.59
29	0	0	0	0	---	0	0.65	11	3.2	1.7	0.78	0.56
30	0	0	0	0	---	0	0.61	11	3.1	1.6	0.75	0.56
31	0	---	0	0	---	0	---	11	---	1.3	0.72	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	6.94	133.70	210.1	59.0	32.89	20.52
MEAN	0	0	0	0	0	0	0.23	4.31	7	1.9	1.06	0.68
AC-FT	0	0	0	0	0	0	14	265	417	117	65	41
MAX	0	0	0	0	0	0	0.9	11	11	3	1.7	0.81
MIN	0	0	0	0	0	0	0	0.65	3.1	1.3	0.72	0.56
CAL YR	2009	TOTAL	605.76	MEAN	1.66	MAX	13	MIN	0	AC-FT	1200	
WTR YR	2010	TOTAL	463.15	MEAN	1.27	MAX	11	MIN	0	AC-FT	919	

MAX DISCH: 19.4 CFS AT 19:00 ON May. 28,2010 GH 1.16 FT. SHIFT -0.03 FT.

MAX GH: 1.16 FT. AT 19:00 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062000 EWING DITCH ATTENNESSEE PASS
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
09062500 WURTZ DITCH NEAR TENNESSEE PASS
Water Year 2010

Location.--	Lat. 39°21'15", Long. 106°21'09"; diverts water from tributaries of Eagle River in Colorado River basin to West Tennessee Creek (tributary to Tennessee Creek) in sec. 17, T.8 S., R.80 W., in Arkansas River basin.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage which was relocated to the correct location this water year. Control is a 6-foot steel Parshall flume.
Hydrologic Conditions.--	The Wurtz Ditch, in combination with the Wurtz Ditch Extension, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable for the seasonally operated gage, except as follows. May 10-16, 2010 in which the gage height was affected by ice within the flume. Checks between the primary and backup records agreed within +/- 0.02 feet.
Datum Corrections.--	Levels were run Sept 23, 2008. Some unevenness along the flume floor at the staff gage along with upstream apron elevation were noted.
Rating.--	A standard 6-ft. Parshall flume table (WURDITCO01 dated June 22, 1971) was used this water year. Three discharge measurements (Nos.98-100) were made during this water year. Measurements ranged in discharge from 0.00 to 29.9 cfs. These measurements cover the range of stage experienced for the water year except for higher flows of May 27 thru June 10, 2010. The peak discharge of 74.9 cfs occurred at 1845 on June 6, 2010 at a gage height of 2.00 ft with a shift of +0.04 ft. It exceeded the stage of measurement no. 99, made June 6, 2010, by 0.88 feet.
Discharge.--	Measurements are made in the flume at the staff gage. Variable shift curve WURDITCOVS10 was developed by analysis of current and historical measurements and was applied to the standard rating for the entire water year. Measurements #98 and #99 were adjusted by -1% and -2%, respectively, for smoothing purposes in the variable shift curve.
Special Computations.--	Discharge on ice affected days was estimated using chart data and temperature data from Turquoise Reservoir. Ice spike data was smoothed and averaged for the day.
Remarks.--	Record is considered good except for ice affected days of May 10-16, 2010 which were considered poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	More attempts to measure flows near the peak this year will help to better establish the variable stage shift relationship at the upper end. Additionally, a level survey and flume inspection should be completed to confirm flume conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09062500 WURTZ DITCH NEAR TENNESSEE PASS

RATING TABLE--

WURDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	40	0	0	0
2	0	0	0	0	0	0	0	0	36	0	0	0
3	0	0	0	0	0	0	0	0	34	0	0	0
4	0	0	0	0	0	0	0	0	42	0	0	0
5	0	0	0	0	0	0	0	1	49	0	0	0
6	0	0	0	0	0	0	0	1.5	55	0	0	0
7	0	0	0	0	0	0	0	1.4	50	0	0	0
8	0	0	0	0	0	0	0	0.69	44	0	0	0
9	0	0	0	0	0	0	0	2.4	39	0	0	0
10	0	0	0	0	0	0	0	2.1	33	0	0	0
11	0	0	0	0	0	0	0	1.8	27	0	0	0
12	0	0	0	0	0	0	0	1.8	25	0	0	0
13	0	0	0	0	0	0	0	1.6	28	0	0	0
14	0	0	0	0	0	0	0	1.7	16	0	0	0
15	0	0	0	0	0	0	0	1.5	0.01	0	0	0
16	0	0	0	0	0	0	0	2.2	0	0	0	0
17	0	0	0	0	0	0	0	2.4	0	0	0	0
18	0	0	0	0	0	0	0	3.6	0	0	0	0
19	0	0	0	0	0	0	0	4.4	0	0	0	0
20	0	0	0	0	0	0	0	4.1	0	0	0	0
21	0	0	0	0	0	0	0	8	0	0	0	0
22	0	0	0	0	0	0	0	13	0	0	0	0
23	0	0	0	0	0	0	0	18	0	0	0	0
24	0	0	0	0	0	0	0	20	0	0	0	0
25	0	0	0	0	0	0	0	14	0	0	0	0
26	0	0	0	0	0	0	0	17	0	0	0	0
27	0	0	0	0	0	0	0	31	0	0	0	0
28	0	0	0	0	0	0	0	45	0	0	0	0
29	0	0	0	0	---	0	0	51	0	0	0	0
30	0	0	0	0	---	0	0	44	0	0	0	0
31	0	---	0	0	---	0	---	39	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	334.19	518.01	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	10.8	17.3	0	0	0
AC-FT	0	0	0	0	0	0	0	663	1030	0	0	0
MAX	0	0	0	0	0	0	0	51	55	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

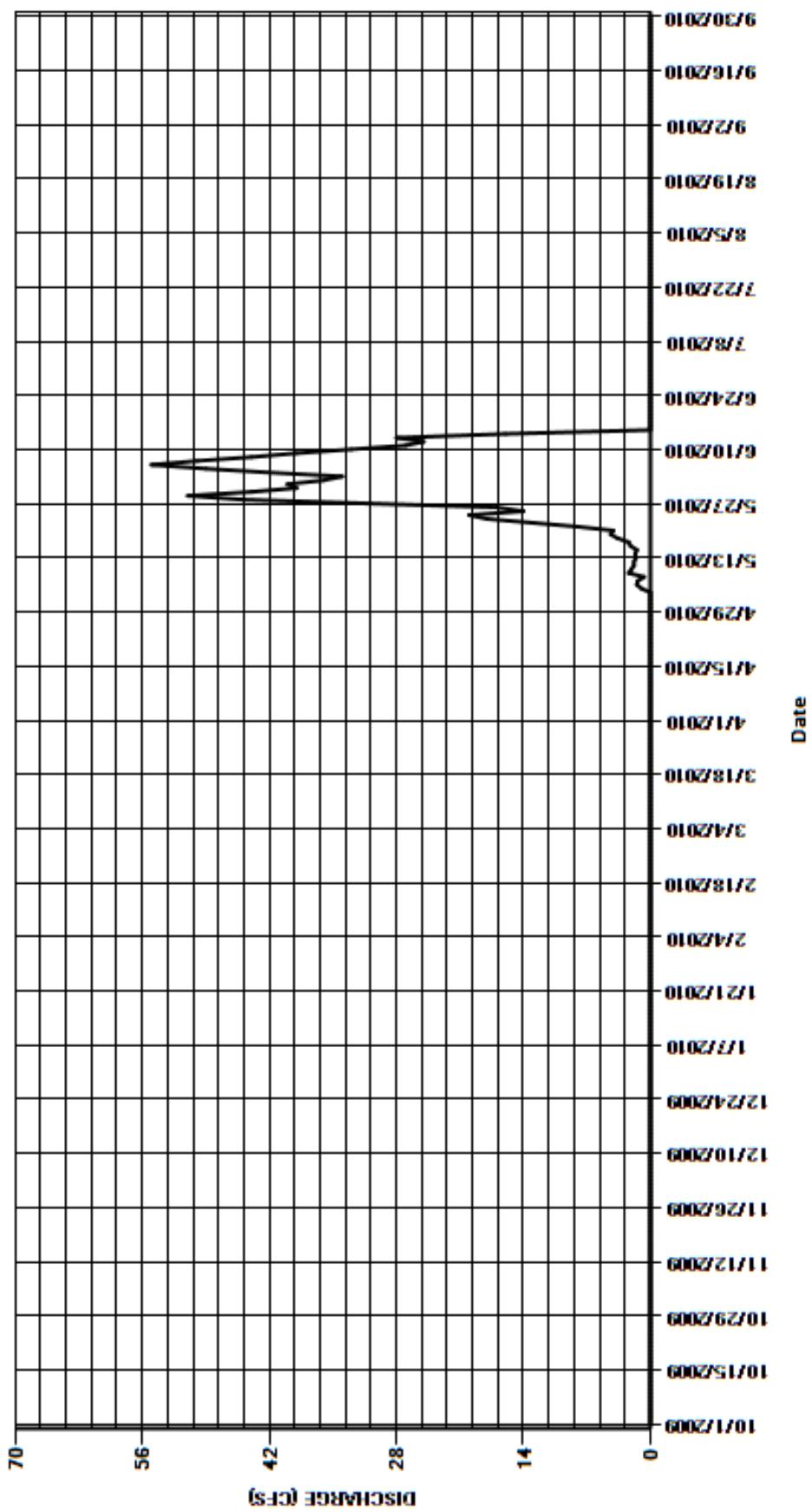
CAL YR	2009	TOTAL	1474.10	MEAN	4.04	MAX	43	MIN	0	AC-FT	2920
WTR YR	2010	TOTAL	852.20	MEAN	2.33	MAX	55	MIN	0	AC-FT	1690

MAX DISCH: 74.9 CFS AT 18:45 ON Jun.06,2010 GH 2 FT. SHIFT 0.04 FT.

MAX GH: 2 FT. AT 18:45 ON Jun.06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062500 WURTZ DITCH NEAR TENNESSEE PASS
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN

WURTZ EXTENSION

Water Year 2010

Location.-- Lat. 39°23'41", Long. 106°21'10", sec. 32, T.7 S., R.80 W., Eagle County.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder, Sutron high data rate SatLink Logger DCP satellite-monitored data collection platform and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot, steel Parshall flume. No changes this water year.

Hydrologic Conditions.-- The Wurtz Extension Ditch, in combination with the Wurtz Ditch, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart recorded and DCP log as backup. The record is complete and reliable for the seasonally operated gage.

Datum Corrections.-- No levels were run this year, previous levels were run September 23, 2008. No datum corrections were necessary. Some unevenness along the flume floor and the position of the outside staff gage were noted.

Rating.-- A standard, 6-ft Parshall flume rating table (WUREXDCO01 dated June 22, 1971) was used this water year. Two discharge measurements, (No. 32, 33) were made during this year with discharges ranging from 0 to 9.33 cfs. These measurements cover the range in stage experienced during the water year, except for higher mean daily flows on June 5-10, 13, 2010. The peak flow of 14.2 cfs occurred at 1845 on June 6, 2010 at a gage height of 0.73 ft with a shift of -0.01 ft. It exceeded the stage of measurement no. 32, made June 10, 2010, by 0.17 ft.

Discharge.-- Measurements are made in the flume at the staff gage and were compared to the standard rating. Variable shift curve WUREXVSHF10 was developed by analysis of current and historical measurements and was applied to the standard rating for the entire water year.

Special Computations.-- No special computations were needed this water year.

Remarks.-- Overall the record is considered good. Station maintained and record developed by Cheston Hart.

Recommendations.-- According to previous levels it is noted the current staff gage needs to be relocated to a distance of 4'-8" from throat. Additionally, a level survey should be performed to confirm floor elevations.

STATE OF COLORADO
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WURTZ EXTENSION

RATING TABLE--

WUREXDCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	7.7	0	0	0
2	0	0	0	0	0	0	0	0	7.4	0	0	0
3	0	0	0	0	0	0	0	0	7.2	0	0	0
4	0	0	0	0	0	0	0	0	8.6	0	0	0
5	0	0	0	0	0	0	0	0	11	0	0	0
6	0	0	0	0	0	0	0	0	12	0	0	0
7	0	0	0	0	0	0	0	0	13	0	0	0
8	0	0	0	0	0	0	0	0	12	0	0	0
9	0	0	0	0	0	0	0	0	11	0	0	0
10	0	0	0	0	0	0	0	0	10	0	0	0
11	0	0	0	0	0	0	0	0	8.7	0	0	0
12	0	0	0	0	0	0	0	0	8.2	0	0	0
13	0	0	0	0	0	0	0	0	9.7	0	0	0
14	0	0	0	0	0	0	0	0	6.7	0	0	0
15	0	0	0	0	0	0	0	0	1.4	0	0	0
16	0	0	0	0	0	0	0	0	0.9	0	0	0
17	0	0	0	0	0	0	0	0	0.42	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	1.4	0	0	0
22	0	0	0	0	0	0	0	0	3	0	0	0
23	0	0	0	0	0	0	0	0	3.8	0	0	0
24	0	0	0	0	0	0	0	0	2.9	0	0	0
25	0	0	0	0	0	0	0	0	2.2	0	0	0
26	0	0	0	0	0	0	0	0	3.4	0	0	0
27	0	0	0	0	0	0	0	0	5.6	0	0	0
28	0	0	0	0	0	0	0	0	7.2	0	0	0
29	0	0	0	0	---	0	0	0	8.1	0	0	0
30	0	0	0	0	---	0	0	0	7.6	0	0	0
31	0	---	0	0	---	0	---	7.3	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.50	135.92	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	1.69	4.53	0	0	0
AC-FT	0	0	0	0	0	0	0	104	270	0	0	0
MAX	0	0	0	0	0	0	0	8.1	13	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

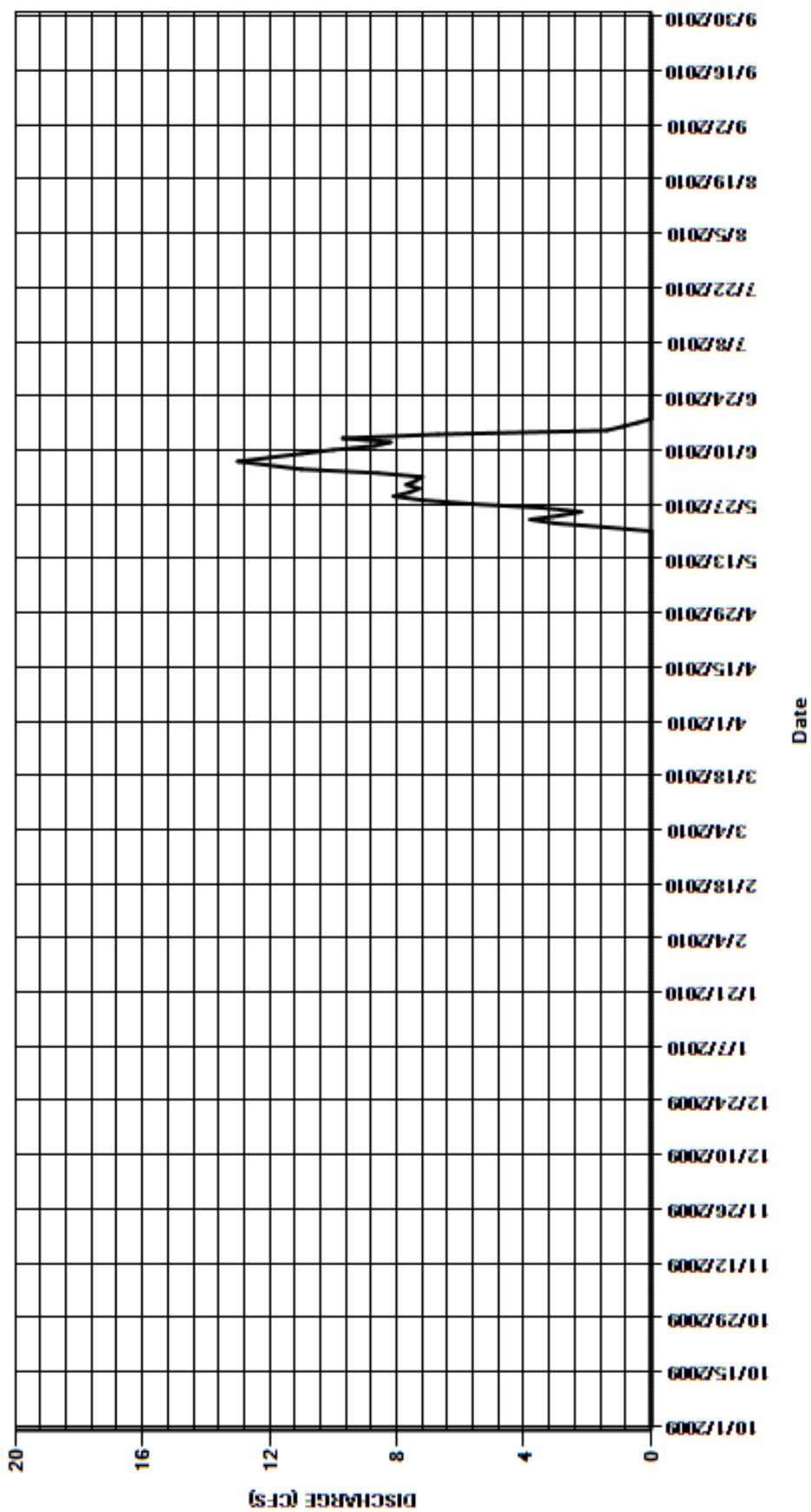
CAL YR	2009	TOTAL	383.80	MEAN	1.05	MAX	14	MIN	0	AC-FT	761
WTR YR	2010	TOTAL	188.42	MEAN	0.52	MAX	13	MIN	0	AC-FT	374

MAX DISCH: 14.2 CFS AT 18:45 ON Jun.06,2010 GH 0.73 FT. SHIFT -0.01 FT.

MAX GH: 0.73 FT. AT 18:45 ON Jun.06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WURTZ EXTENSION
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
09063700 HOMESTAKE TUNNEL
Water Year 2010

Location.-- Lat. 39°16'52", Long. 106°25'56"; Homestake tunnel diverts water from Homestake Lake, in sec. 17, T. 8 S., R. 81 W., in Eagle River basin, to Lake Fork Creek in Arkansas River basin.

Drainage and Period of Record.-- N/A.

Equipment.-- Graphic water-stage recorder, high-data rate satellite-monitored data collection platform (DCP) and shaft encoder in a 4 ft x 4 ft wood shelter and concrete well. Shaft encoder and chart are set to inside electric tape gage and outside staff gage. Control is a 12-foot concrete Parshall flume. No changes in equipment this water year.

Hydrologic Conditions.-- The Homestake Project is categorized as a transmountain diversion structure that collects water from the headwaters of the Eagle River, northwest of Leadville. Water is diverted from several tributaries of Homestake Creek and routed to Homestake Reservoir. Diversions then pass from the reservoir through the Homestake Tunnel to Lake Fork, above Turquoise Reservoir. The collection basin consists primarily of high mountain terrain, some of which is above tree line with no urban development. No hydrologic condition changes were apparent this water year.

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite data with the graphic chart recorder used for backup purposes. The record is complete and reliable for the seasonally operated gage.

Datum Corrections.-- Levels were last run on July 11, 2006.

Rating.-- A standard 12-ft. Parshall flume table (HOMTUNCO01 dated June 11, 1975) was used the entire water year. One discharge measurements (No.119) was made this year with measured discharge of 247 cfs. The range in daily flows during the water year was 0.00 cfs (many days) to 285 cfs. The instantaneous peak discharge of 286 cfs occurred at 1015 on June 15, 2010 at a gage height of 3.01 ft with a shift of +0.09 ft. It exceeded the stage of meas. #119 by 0.26 feet.

Discharge.-- Measurements are made from a bridge near the intake/staff gage position. Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed using shift curve HOMTUNVSHF10, developed during the water year using measurement data from water years 2001-2010. Measurement #119 was adjusted by -1% to fit the shift curve. Subsequent measurements will continue to reinforce the direction of the curve.

Special Computations.-- Variable curve HOMTUNVSHF10 is considered a valid alternative for calculating flows. Negative gage heights were set to 0.00 feet in the record with attention given to transition days for computation of hourly and daily averages. No other special computations were used this water year.

Remarks.-- Record is considered good, however most measurements are rated poor given the surging effect of flows from the tunnel and through the flume. ADCP measurements were attempted but not possible at current measurement location. Station maintained and record developed by Cheston Hart.

Recommendations.-- More research should be attempted to reduce the surge effect. If at all possible new radar technology could be used to find if there are drawdown effects of the well caused by the high velocity flume conditions. A level survey should be completed in the next water year. ADCP measurement should be attempted approximately 100 ft above the flume.

STATE OF COLORADO
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09063700 HOMESTAKE TUNNEL

RATING TABLE--

HOMTUNCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	245
2	0	0	0	0	0	0	0	0	0	0	0	144
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	167	0	0	0
16	0	0	0	0	0	0	0	0	285	0	0	0
17	0	0	0	0	0	0	0	0	285	0	0	0
18	0	0	0	0	0	0	0	0	285	0	0	0
19	0	0	0	0	0	0	0	0	284	0	0	0
20	0	0	0	0	0	0	0	0	284	0	0	0
21	0	0	0	0	0	0	0	0	284	0	0	0
22	0	0	0	0	0	0	0	0	177	0	0	0
23	0	0	0	0	0	0	0	0	0	0	121	0
24	0	0	0	0	0	0	0	0	0	0	249	0
25	0	0	0	0	0	0	0	0	0	0	249	0
26	0	0	0	0	0	0	0	0	0	0	249	0
27	0	0	0	0	0	0	0	0	0	0	248	0
28	0	0	0	0	0	0	0	0	0	0	247	0
29	0	0	0	0	---	0	0	0	0	0	247	0
30	0	0	0	0	---	0	0	0	0	0	247	0
31	0	---	0	0	---	0	---	0	---	0	246	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2051.00	0.00	2103.00	389.00
MEAN	0	0	0	0	0	0	0	0	68.4	0	67.8	13
AC-FT	0	0	0	0	0	0	0	0	4070	0	4170	772
MAX	0	0	0	0	0	0	0	0	285	0	249	245
MIN	0	0	0	0	0	0	0	0	0	0	0	0

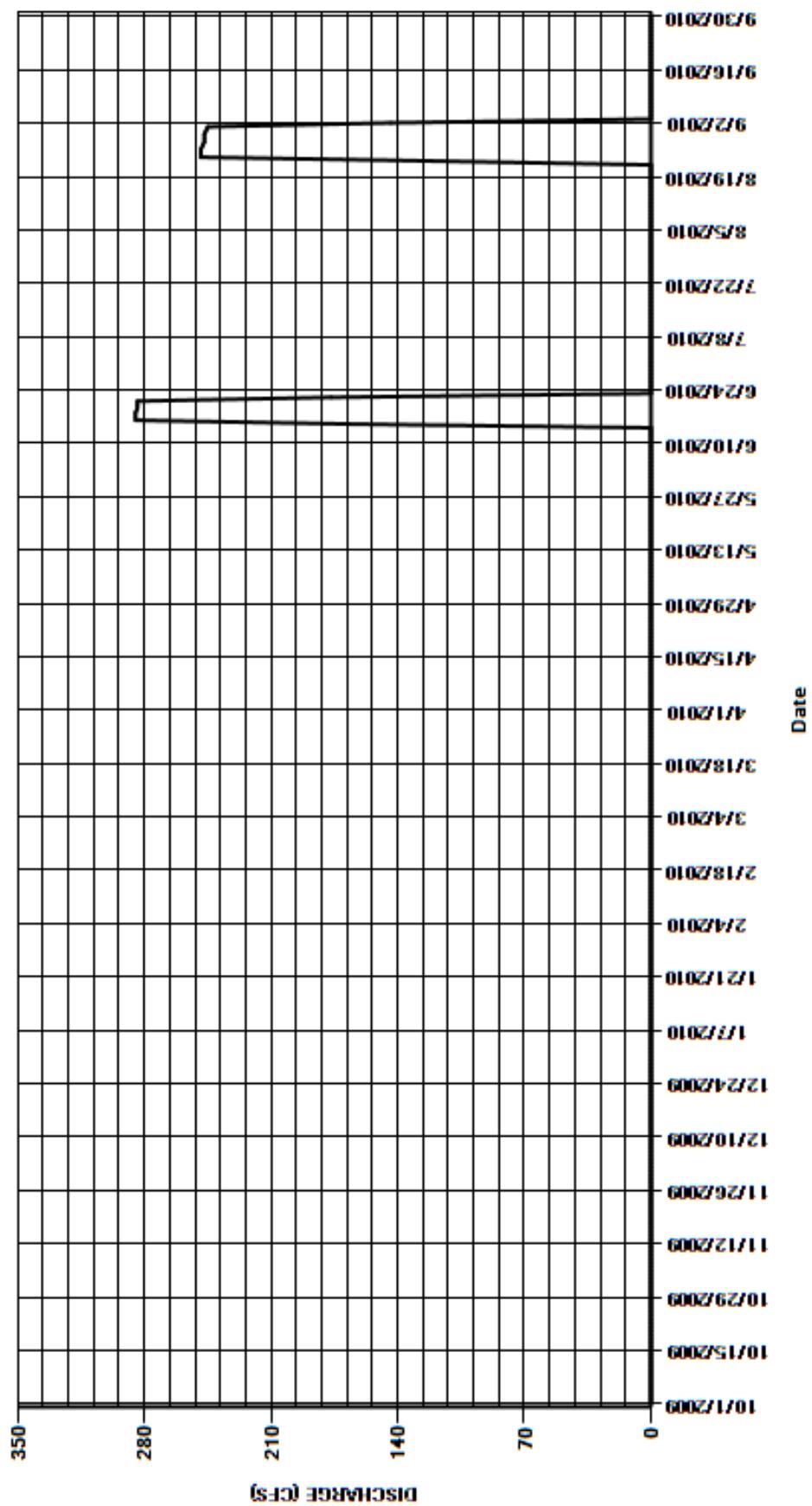
CAL YR	2009	TOTAL	25465.00	MEAN	69.8	MAX	310	MIN	0	AC-FT	50510
WTR YR	2010	TOTAL	4543.00	MEAN	12.4	MAX	285	MIN	0	AC-FT	9010

MAX DISCH: 286 CFS AT 10:15 ON Jun. 16,2010 GH 3.01 FT. SHIFT 0.09 FT.

MAX GH: 3.01 FT. AT 10:15 ON Jun. 16,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09063700 HOMESTAKE TUNNEL
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN

09077160 CHARLES H. BOUSTEAD TUNNEL

Water Year 2010

Location.--	Lat. 39°16'40", Long. 106°25'40"; Charles H. Boustead Tunnel diverts water from the main stem and tributaries of Fryingpan River in Colorado River basin, to Lake Fork in sec. 10, T. 9 S., R. 81 W., in Arkansas River basin.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron 8210 DCP) and shaft encoder in a 5'X5' concrete shelter and well at a 15-foot concrete Parshall Flume. Shaft encoder and chart are set to inside electric tape gage. Outside staff gage used for supplemental reference gage. Bridge across concrete section at the entrance to the converging section of the flume is used for making high water cable measurements. No changes this water year.
Hydrologic Conditions.--	The Charles H. Boustead Tunnel (a.k.a. Divide Tunnel) transports water from the Fryingpan River under the Continental Divide to the head of Turquoise Reservoir in the Arkansas River Basin. Diversions from the west slope are made from an elevation 10,002 feet. The Boustead Tunnel is approximately 5.4 miles long, is horseshoe shaped with a diameter of 10.5 feet, has a maximum overburden of approximately 2000 feet, and a decreed capacity of 945 cubic feet per second. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the graphic chart recorder used for backup purposes. Record is complete and reliable.
Datum Corrections.--	Levels were last run on Aug 11, 2005. Elevation control was established using RM #1 (Elev 9.75) as base. No corrections were necessary.
Rating.--	Control is a 15-foot concrete Parshall Flume. A standard 15-ft. Parshall flume table (BOUTUNCO01 dated May 16, 1972) was used this water year. Four discharge measurements (No. 64-67) were made during the year. Measurement ranged in discharge from 64.7 cfs to 945 cfs. They cover the range in stage experienced, except many low and medium flow days of Oct 1, 2009 – May 17, 2010; July 10 – Aug 2, and Aug 7- Sept 30, 2010; and higher mean daily flows on June 6, 9 2010. The peak flow of 973 cfs occurred at 1530 June 9, 2010 at a gage height of 5.58 ft with a shift of +0.26 ft. It exceeded the stage of meas. # 66, made June 7, 2010, by 0.12 feet.
Discharge.--	Shifts were distributed by stage for the entire water year of good record using shift curve BOUTUNCOVS10, which is based on a number of previous and current year measurements. This variable shift curve is slightly modified in the mid range but otherwise is the same as the shift curve developed in WY04 and applied to real-time data and record by agreement with the USBR, the SECWCD, and Water Division 5. Measurements show raw shifts ranging from -0.02 ft to +0.27 ft. Measurement nos. 64-67 were discounted from -3% to 5% to smooth distribution and fit the historical shift curve.
Special Computations.--	ADCP measurements were performed this water year and it was found the boat could not handle flows much higher than a GH of 3 ft. The tunnel surges therefore most measurements with the ADCP were performed using 8 transects to average the surge.
Remarks.--	Record is considered good. The Boustead Tunnel flume is located approximately 90 feet downstream of the mouth of Boustead Tunnel. The approach channel from the mouth of the tunnel to the flume is a concrete rectangular section. The channel section diverges in width from the tunnel width at the mouth to a width of approximately 25 feet over a distance of about 70 feet. This is followed by approximately 20 feet of channel having a constant 25-ft width. This constant width section ends at the flume entrance. The floor of the approach channel is flat. There are no provisions over this 90-foot reach for a deeper channel section prior to the flume entrance, nor any other channel modifications, to help still and slow the flow to the recommended tranquil flow conditions. Observations of flow conditions at higher stages over the past several years have indicated the approach velocities to the flume are too high and poorly distributed by the time flow reaches the flume entrance. This results in increasing positive shifts to the rating as stage increases. Station operated and record developed by Cheston Hart.
Recommendations.--	More testing of the ADCP and additional ADCP measurements should be attempted. Due to the access and difficulty in setting up temporary cable the ADCP was limited to testing only in flume in WY10. Downstream conditions may allow higher flow measurements to be performed using the ADCP. Additional measurements are needed in GH range of 2.5 to 4.0 ft to better define the variable stage shift relationship and where the transition away from the standard 15 ft PF rating occurs. Levels also should be performed this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09077160 CHARLES H. BOUSTEAD TUNNEL

RATING TABLE--

BOUTUNCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

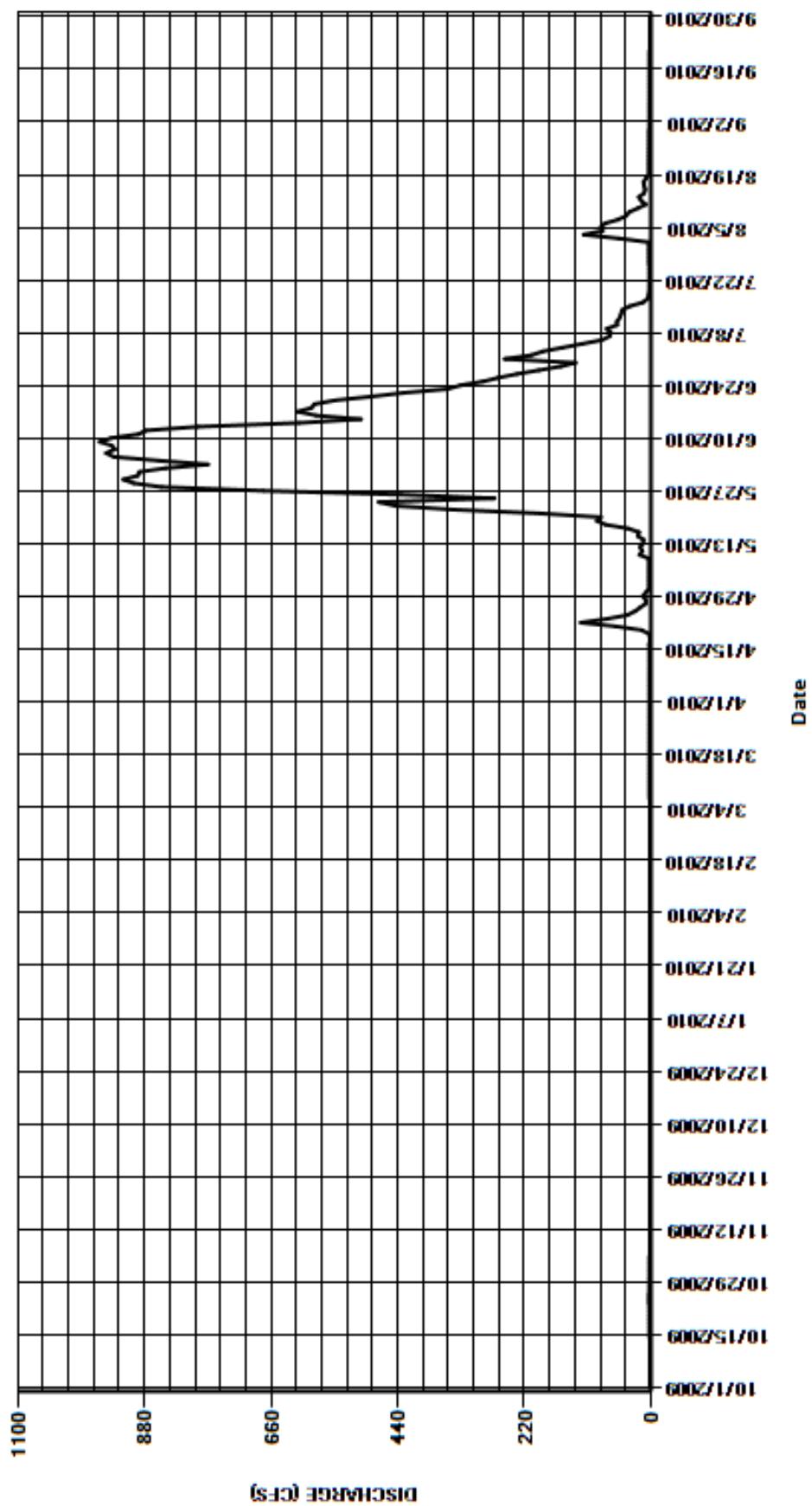
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	2.5	1.9	1.9	1.9	1.9	2.5	3.1	889	254	3.4	2.8
2	1.8	2.5	1.9	1.9	1.9	2	2.5	3.1	844	208	56	2.8
3	1.9	2.5	1.9	1.9	1.9	2.2	2.5	3.1	770	188	117	2.8
4	1.9	2.5	1.9	1.9	1.9	2.2	2.5	3.1	854	154	84	2.8
5	1.9	2.3	1.9	1.9	1.9	2.2	2.5	3.1	933	120	87	2.8
6	1.9	2.2	1.9	1.9	1.9	2.3	2.6	3.1	947	86	80	2.8
7	1.9	2.2	1.9	1.9	1.9	2.5	2.5	3.1	932	72	57	2.8
8	1.9	2.2	1.9	1.9	1.9	2.5	2.5	3.1	937	70	43	2.5
9	1.9	2.2	1.9	1.9	1.9	2.5	2.5	3.2	958	77	38	2.5
10	1.9	2.2	1.9	1.9	1.9	2.5	2.5	20	938	59	23	2.5
11	1.9	2.2	1.9	1.9	1.9	2.5	2.5	15	891	59	9	2.5
12	2.1	2.2	1.9	1.9	1.9	2.5	2.5	19	878	54	17	2.5
13	2.2	2	1.9	1.9	1.9	2.5	2.5	14	787	52	21	2.5
14	2.3	1.9	1.9	1.9	1.9	2.5	2.5	13	612	50	12	2.5
15	2.5	1.9	1.9	1.9	1.9	2.5	2.9	23	504	37	10	2.5
16	2.5	1.9	1.9	1.9	1.9	2.5	3.3	21	582	14	12	2.5
17	2.5	1.9	1.9	1.9	1.9	2.5	2.2	40	614	5.8	13	2.5
18	2.8	1.9	1.9	1.9	1.9	2.5	2.2	79	590	3.8	8.3	2.5
19	2.8	1.9	1.9	1.9	1.9	2.5	3.1	94	585	3.1	3.5	2.5
20	2.8	1.9	1.9	1.9	1.9	2.5	16	87	550	3	3.7	2.5
21	2.8	1.9	1.9	1.9	1.9	2.5	61	193	487	2.8	3.7	2.4
22	2.8	1.9	1.9	1.9	1.9	2.5	122	343	430	2.8	3.7	2.2
23	3.1	1.9	1.9	1.9	1.9	2.5	76	444	354	2.8	3.5	2.2
24	3.1	1.9	1.9	1.9	1.9	2.5	41	473	331	2.8	3.4	2.2
25	3.1	1.9	1.9	1.9	1.9	2.5	28	272	292	3	3.4	2.2
26	3.1	1.9	1.9	1.9	1.9	2.5	19	435	266	3.1	3.4	2.2
27	2.9	1.9	1.9	1.9	1.9	2.5	9.4	674	233	3.1	3.2	2.1
28	2.8	1.9	1.9	1.9	1.9	2.5	8.9	851	195	3.1	3.1	1.9
29	2.8	1.9	1.9	1.9	---	2.5	14	899	157	3.2	3.1	1.9
30	2.8	1.9	1.9	1.9	---	2.5	9	917	131	3.4	3.1	1.9
31	2.5	---	1.9	1.9	---	2.5	---	892	---	3.4	3.1	---
TOTAL	75.0	62.0	58.9	58.9	53.2	75.3	453.1	6846.0	18471	1603.2	734.6	73.3
MEAN	2.42	2.07	1.9	1.9	1.9	2.43	15.1	221	616	51.7	23.7	2.44
AC-FT	149	123	117	117	106	149	899	13580	36640	3180	1460	145
MAX	3.1	2.5	1.9	1.9	1.9	2.5	122	917	958	254	117	2.8
MIN	1.8	1.9	1.9	1.9	1.9	1.9	2.2	3.1	131	2.8	3.1	1.9
CAL YR	2009	TOTAL	42316.2	MEAN	116	MAX	906	MIN	1.7	AC-FT	83930	
WTR YR	2010	TOTAL	28564.5	MEAN	78.3	MAX	958	MIN	1.8	AC-FT	56660	

MAX DISCH: 973 CFS AT 15:30 ON Jun. 09,2010 GH 5.58 FT. SHIFT 0.26 FT.

MAX GH: 5.58 FT. AT 15:30 ON Jun. 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077160 CHARLES H. BOUSTEAD TUNNEL
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
09077500 BUSK-IVANHOE TUNNEL
Water Year 2010

Location.--	Lat. 39°14'55", Long. 106°28'14"; Water diverted from Ivanhoe Lake, tributary to Fryingpan River in sec. 13, T. 9 S., R. 82 W., in Roaring Fork River Basin, to Busk Creek (tributary to Lake Fork) in sec. 20, T. 9 S., R. 81 W., in Arkansas River Basin.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 3 ft x 3 ft metal shelter and well. Shaft encoder and chart recorder are set to outside staff gage. Control is a 5-foot steel Parshall flume. The flume and well house are new this water year (10/12/2009). Shaft encoder replaced 5/3/2010. No other changes this water year.
Hydrologic Conditions.--	The Busk-Ivanhoe Tunnel (a.k.a. the Carlton Tunnel) was originally built as a railroad Tunnel. The tunnel diverts water from the headwaters of Ivanhoe Creek, a tributary of the Fryingpan River. The Tunnel is 1.3 miles long and delivers the water to Busk Creek, which is tributary to the Turquoise Reservoir of the Arkansas River Basin. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydraulic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. Record is complete and reliable. The following dates required further analysis: October 13, 2009 – Start up of flows for the water year. Hours 12:00 – 13:00 required transition to steady flow. Data was estimated without loss of accuracy. February 27, 2010 – Missing data 08:45-09:30. Gage heights were estimated using adjacent stable data without loss of accuracy. March 14, 2010 – Missing data 02:00-02:45. Gage heights were estimated using adjacent stable data without loss of accuracy.
Datum Corrections.--	Levels were not run this year.
Rating.--	A standard 5-ft. Parshall flume table (STD05FTP09) was used the entire water year. Four discharge measurements (Nos. 103-107) were made during the year. They covered the range in flows except for the many lower daily flows of Oct 1- April 22, May 9; July 19 – 27, 29-31, Aug 1- Sept 30 2010; and the higher mean daily flows of May 28-31, June 1, 6, 7, 2010. The peak discharge 46.4 cfs occurred at 0900 on June 1, 2010 at a gage height of 1.70 ft (gage height correction of +0.02 ft applied) with a shift of +0.00 ft. It exceeded the stage of meas. #106, made June 7, 2010, by 0.22 feet.
Discharge.--	Shifts were distributed by time the entire year. Given this is the first year of this flume no variable shift curves were established. Measurement #104-106 were discounted +1% to +5% to a shift of 0.00 ft. There were also some changes to the approach by adding additional metal to the inlet angle of the flume. The positive shifts during higher flows are assumed to be caused by the poor approach angle. This was fixed near the end of the water season.
Special Computations.--	No special computations were used this year.
Remarks.--	Gage is operated during the winter months without a chart. The site is visited by Rick Sexton (Pueblo Board of Water Works) by snow machine when needed during these months that the gage is not accessible by vehicle. The gage remains ice free by running a 1" water line from the tunnel directly into the well. The flume inlet is 2-in diameter, which allows a constant flow through the inlet and helps keep the well thawed and remains accurate. Overall the record is considered good, except for the winter operation months of October thru April and those are considered poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	Additional measurements need to be made to determine the effects of the approach. Bench marks and levels need to be run as soon as possible in 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077500 BUSK-IVANHOE TUNNEL

RATING TABLE--

STD05FTP09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	1.2	0.99	0.88	0.69	0.6	0.36	7.6	46	10	1.3	1.3
2	0	1.3	0.95	0.89	0.69	0.6	0.36	7	35	9.6	1.4	1.3
3	0	1.4	0.88	0.98	0.66	0.6	0.36	5	30	9.3	1.4	1.3
4	0	1.3	0.88	0.99	0.68	0.6	0.36	4.7	33	9.2	1.4	1.3
5	0	1.3	0.88	0.98	0.69	0.6	0.36	4.1	36	8.9	1.4	1.2
6	0	1.3	0.81	0.82	0.69	0.6	0.36	3.5	37	8.7	1.4	1.2
7	0	1.2	0.88	0.79	0.69	0.6	0.35	3.1	37	7.7	1.4	1.2
8	0	1.2	0.86	0.74	0.69	0.6	0.37	2.9	36	6.7	1.4	1.2
9	0	1.2	0.83	0.61	0.69	0.6	0.44	2.7	36	6.4	1.4	1.2
10	0	1.2	0.79	0.6	0.61	0.6	0.5	3.1	36	6.1	1.4	1.2
11	0	1.2	0.79	0.6	0.6	0.6	0.59	3.3	35	6	1.4	1.2
12	0	1.1	0.87	0.6	0.6	0.57	0.71	3.2	33	5.7	1.5	1.2
13	1.2	1.2	0.88	0.6	0.6	0.54	0.79	3.3	33	5.5	1.4	1.2
14	2.6	1.3	0.9	0.6	0.69	0.52	0.83	3.4	32	5.3	1.4	1.1
15	2.5	1.3	0.99	0.68	0.69	0.52	0.94	3.5	32	4.9	1.4	1.1
16	2.3	1.3	0.99	0.69	0.69	0.52	1.1	3.4	31	4.4	1.4	1
17	2.1	1.3	1.1	0.69	0.69	0.48	1.3	3.4	30	4.2	1.4	1
18	2	1.3	1	0.69	0.69	0.44	1.3	3.5	27	3.8	1.4	0.99
19	1.9	1.2	0.99	0.75	0.69	0.44	1.4	3.8	25	2.4	1.5	0.99
20	1.8	1.2	0.99	0.79	0.69	0.44	1.6	4	25	1.3	1.5	0.99
21	1.6	1.1	0.99	0.79	0.69	0.44	2.1	5	25	1.3	1.4	0.99
22	1.5	1.1	0.88	0.79	0.75	0.44	2.7	8.3	24	1.3	1.4	0.99
23	1.4	1.1	0.88	0.77	0.83	0.44	2.9	14	19	1.3	1.4	0.99
24	1.3	1.1	0.85	0.69	0.74	0.44	3.2	24	17	1.3	1.4	0.99
25	1.4	1.2	0.71	0.69	0.69	0.44	3.6	23	14	1.3	1.4	2.1
26	1.4	1.1	0.69	0.69	0.61	0.44	4.1	26	13	1.3	1.4	2.8
27	1.3	1.1	0.69	0.69	0.6	0.44	5.6	35	11	1.2	1.4	2.7
28	1.3	1.1	0.69	0.69	0.6	0.44	6.9	38	11	4.5	1.4	2.6
29	1.4	1	0.76	0.69	---	0.42	7.5	40	10	1.2	1.3	2.4
30	1.3	0.99	0.8	0.69	---	0.36	8.1	43	10	1.2	1.3	2.3
31	1.3	---	0.88	0.69	---	0.36	---	45	---	1.3	1.3	---
TOTAL	31.60	35.89	27.07	22.84	18.92	15.73	61.08	379.8	819	143.3	43.3	42.03
MEAN	1.02	1.2	0.87	0.74	0.68	0.51	2.04	12.3	27.3	4.62	1.4	1.4
AC-FT	63	71	54	45	38	31	121	753	1620	284	86	83
MAX	2.6	1.4	1.1	0.99	0.83	0.6	8.1	45	46	10	1.5	2.8
MIN	0	0.99	0.69	0.6	0.6	0.36	0.35	2.7	10	1.2	1.3	0.99

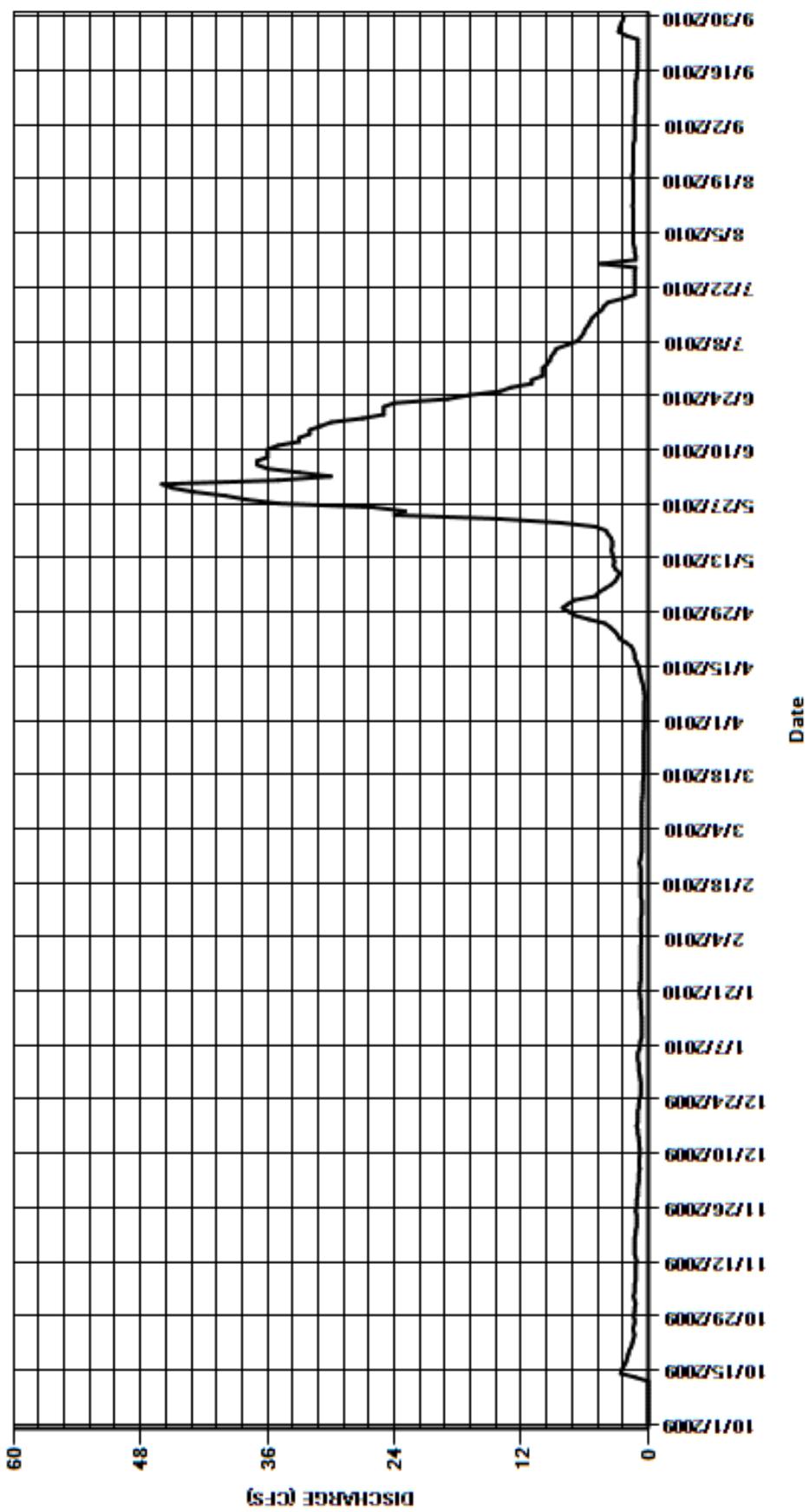
CAL YR	2009	TOTAL	1672.78	MEAN	4.58	MAX	38	MIN	0	AC-FT	3320
WTR YR	2010	TOTAL	1640.56	MEAN	4.49	MAX	46	MIN	0	AC-FT	3250

MAX DISCH: 46.4 CFS AT 09:00 ON Jun. 01,2010 GH 1.7 FT. SHIFT 0 FT. (GH CORR. OF +0.02 FT APPLIED)

MAX GH: 1.7 FT. AT 09:00 ON Jun. 01,2010 (GH CORR. OF +0.02 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**09077500 BUSK-IVANHOE TUNNEL
WY2010 HYDROGRAPH**



ARKANSAS RIVER BASIN
09073000 TWIN LAKES TUNNEL
Water Year 2010

Location.--	Lat. 39°04'56", Long. 106°32'24"; diverts water from tributaries of Roaring Fork River in Colorado River Basin to North Fork Lake Creek in sec. 22, T.11 S., R.82 W., in Arkansas River Basin.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (DCP) and shaft encoder in a 5 ft x 5 ft concrete shelter and well. Shaft encoder and chart are set to inside electric tape gage. An outside staff gage is used for supplemental reference. Control is a 12-foot concrete Parshall flume. No changes this water year.
Hydrologic Conditions.--	The collection system is located in the headwaters of the Roaring Fork River. Water is diverted in Grizzly reservoir, which is located in Lincoln Gulch, Grizzly has an active capacity of 570 acre-feet, but normally fluctuates less than 400 acre-feet. From Grizzly Reservoir, the water flows under the continental divide through the Twin lakes (a.k.a. Independence pass) Tunnel into North Fork Lake Creek. The Twin lakes Tunnel is circular, concrete lined and 8.5 feet in diameter. The tunnel is about 4 miles long and has a capacity of 625 cubic feet per second. The western portal of the Twin Lakes tunnel is an elevation of 10,520 feet, the eastern portal is at 10,460 feet, and the tunnel has a maximum overburden of 2630 feet. During the winter the snow closes the road between the caretaker's house and the town of Aspen, the tunnel is then operated to allow the caretaker's family to travel thru the tunnel to Buena Vista each day. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record and DCP log as backup. Record is complete and reliable except as follows: December 3-8, 2009, when the float tape was frozen in place; winter operation (Nov-Mar) is unreliable due to a drain pipe used to circulate water through the well as a de-icing mechanism. Usage of drain valve this year did not seem to affect gage height and did help in decreasing ice effect. Short periods of missing unit values on March 14, April 14, 21-22, June 12-13, 2010 were filled in using adjacent hourly data.
Datum Corrections.--	Levels were run on 22 Oct 2007. No corrections were made.
Rating.--	A standard 12-ft. Parshall flume table (STD12FPF dated May 16, 1972) was used the entire water year. Three discharge measurements (Nos. 101-103) were made during the year. Measurements ranged in discharge from 30.6 to 582 cfs. They cover the range in stage experienced except for many low flow days of Oct 1,2, 5-8, 12-22, 24-31; Nov 1-7, 9-30; Dec 1 thru Mar 31; Apr 1-17, 19, 20, 25-30; May 1-5, 7, 8, 17; July 27; Aug 16, 25, 27-31; Sept 1-30 2010 and higher flows of May 30, 31; June 1, 5-12, 2010. The peak discharge of 616 cfs occurred at 2345 June 6, 2010 at a gage height of 5.01 ft with a shift of 0.00 ft. It exceeded the mean stage of meas. #102, made June 2, 2010 by 0.19 feet.
Discharge.--	Wading measurements may be made in the flume at the staff gage (using extreme caution) up to a gage height of about 1.80 ft. High flow measurements are made with a bridge crane with the meter and weight assembly suspended at the outside staff gage position in the flume. A rigid 2-in pipe is installed at this location to act as a stay bar to reduce meter and weight movement downstream. Hose clamps on the pipe are used to control the position of the cable and reduce meter and weight lateral movement caused by the extreme turbulence in the measurement section. This measurement section is a standard 14.7 ft width. Shifting control method was used for the entire water year. Shifts occur due to excessive approach velocities and the turbulence/ waves in the flume due to the approach section entering the flume at an angle. These problems are exacerbated in the gage height range of 2.5 to 4.5 ft. The high approach velocities and the extreme turbulence in the flume at the highest stages (4.5 to 5.1) appear to compensate for each other and result in the flume performing relatively close to the standard rating at the higher gage heights. Shifts were distributed by stage using the variable stage-shift relationship TWINTUNCOSC10 for the entire water year, which is based upon measurement trends of several years.
Special Computations.--	Variable curve TWITUNCOSC10 is considered a valid alternative for calculating flows. Although it is difficult to read the outside staff at high flows due to surging and turbulence, it appears there is draw down in the well that may be caused by the flow high velocities and/or the drain valve being open or non-functional. Discharge during period of frozen float tape estimated by using adjacent data from December 2 and December 9 with linear interpolation.
Remarks.--	Record is considered good, except for the winter months of November thru March, which is poor. An ADVM is installed in the Tunnel upstream of the mouth but up to this point has not produced reliable data. Station maintained and record developed by Cheston Hart.
Recommendations.--	Additional high flow measurements are needed to better define shifts to the rating at medium and higher stages. Measurements and stage recording at the flume would benefit considerably from flow straightening and energy dissipation baffles installed upstream of the flume entrance. C. Hart 12/28/2010 REVISED 1/28/2011

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09073000 TWIN LAKES TUNNEL

RATING TABLE--

STD12FTP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	20	8.3	5.7	3.1	3.8	6.5	19	586	174	95	21
2	14	9.3	8.8	5.7	3.6	1.4	4.2	24	579	192	102	14
3	36	1.6	7.5	5.7	3.1	2.1	2.9	10	542	139	145	17
4	38	1.6	7.5	5.5	3.5	4.4	2.1	18	509	183	92	0.79
5	0.4	1.6	7.2	3.9	2.2	4.7	2.2	16	587	134	201	0.66
6	0.43	1.6	6.8	3.7	6.2	7.9	2.9	38	609	99	124	0.66
7	13	11	6.4	6.7	4	3.8	6.4	14	609	105	86	0.66
8	19	44	6.4	5.2	2.8	1.6	6.2	4.5	607	91	98	0.66
9	0.91	1.2	6.5	6.5	3.4	2.6	4.3	45	606	89	68	0.66
10	68	6.1	5	4.9	3.7	3.6	3.1	48	607	95	70	2.3
11	38	12	6.9	3.1	3	3.8	8.4	56	602	85	44	9.7
12	0.67	18	13	3.5	4.6	5	1.9	63	589	95	69	5.1
13	1.2	13	8.5	5.5	3.8	5.2	3.7	43	448	71	51	23
14	1.5	21	4	4.2	2.8	4.7	5.5	43	293	92	60	9.1
15	1.4	16	6.6	3.5	2.8	1.4	5.5	43	260	49	31	14
16	18	12	6.3	7.8	3	2.4	7.6	43	286	55	28	12
17	21	8	7.8	5	2.9	4.5	4.6	27	376	59	73	10
18	1.5	3.4	6.6	3.2	4.8	4.1	36	92	388	47	42	6.9
19	12	19	5.2	1.7	4.5	3.5	16	96	423	43	34	12
20	17	13	5.4	3	5.4	2.8	17	80	406	38	63	6.7
21	15	13	8.2	2.9	4.2	5.2	43	140	368	40	41	6.2
22	20	8.9	11	2.9	2.1	2.4	47	186	332	56	39	9.5
23	38	2.8	2.5	7.5	1.7	3.5	53	196	294	73	34	21
24	23	6.3	4.6	4.8	4.1	2.5	46	224	273	49	34	12
25	16	7.5	8	3	2.4	4.5	26	155	291	42	26	15
26	1.4	9.7	7.6	6.1	3.4	3.2	22	224	260	41	35	11
27	1.5	10	3.2	6	4.1	5	27	341	243	23	21	9.1
28	1.6	9.9	6.3	4.2	8.2	6.7	15	491	205	43	25	8.5
29	15	9.3	6.1	4.5	---	1.7	20	567	208	43	18	8.1
30	17	9.5	5.7	4.5	---	1.8	17	586	195	84	26	11
31	8.8	---	5.7	2.8	---	4.6	---	586	---	64	25	---
TOTAL	476.31	320.3	209.6	143.2	103.4	114.4	463.0	4518.5	12581	2493	1900	278.29
MEAN	15.4	10.7	6.76	4.62	3.69	3.69	15.4	146	419	80.4	61.3	9.28
AC-FT	945	635	416	284	205	227	918	8960	24950	4940	3770	552
MAX	68	44	13	7.8	8.2	7.9	53	586	609	192	201	23
MIN	0.4	1.2	2.5	1.7	1.7	1.4	1.9	4.5	195	23	18	0.66

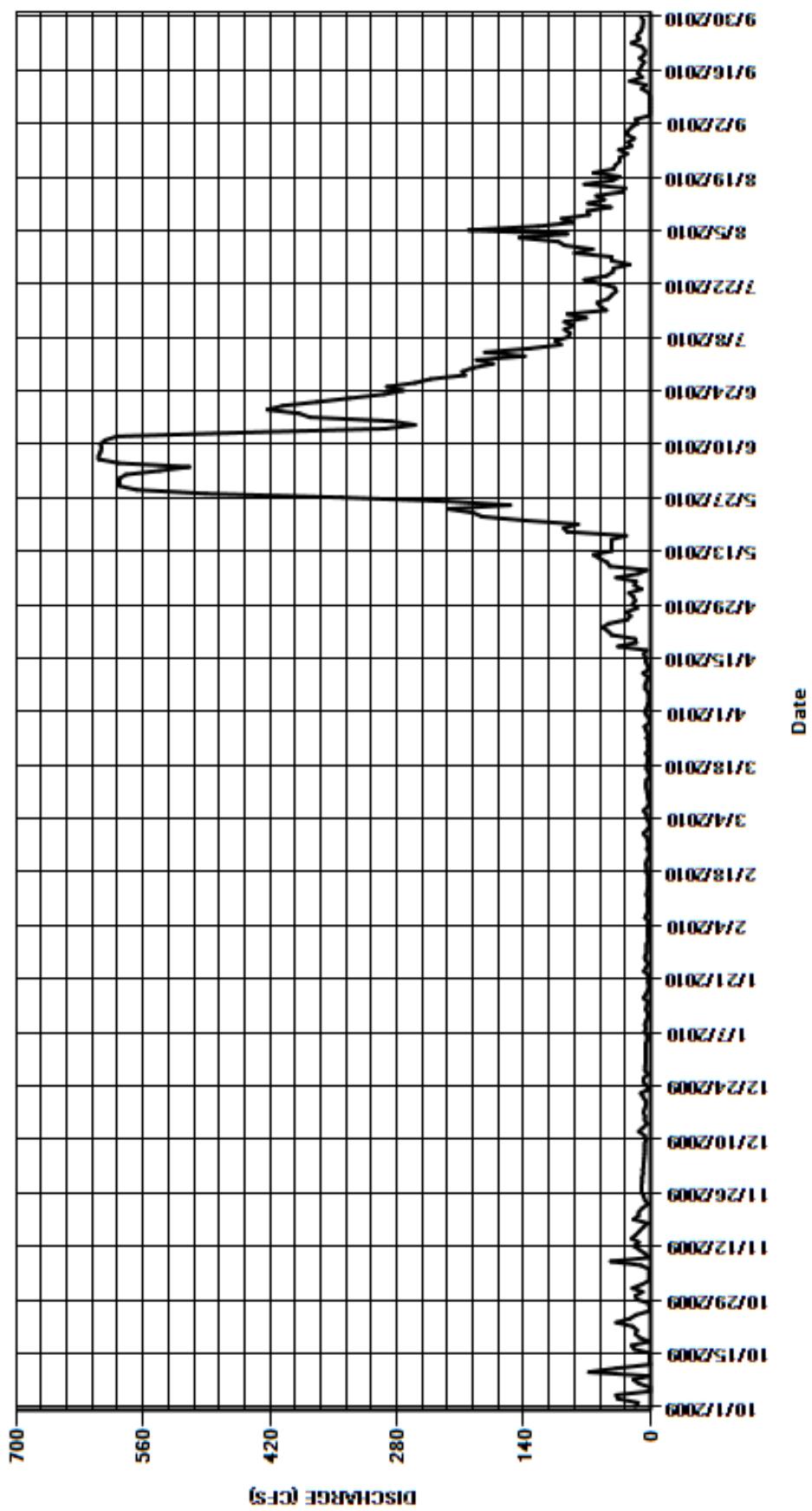
CAL YR	2009	TOTAL	29652.23	MEAN	81.2	MAX	611	MIN	0.4	AC-FT	58820
WTR YR	2010	TOTAL	23601.00	MEAN	64.7	MAX	609	MIN	0.4	AC-FT	46810

MAX DISCH: 616 CFS AT 23:45 ON Jun. 06,2010 GH 5.01 FT. SHIFT 0 FT.

MAX GH: 5.01 FT. AT 23:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09073000 TWIN LAKES TUNNEL
WY2010 HYDROGRAPH



ARKANSAS RIVER BASIN
LARKSPUR DITCH AT MARSHALL PASS
Water Year 2010

Location.--	Lat. 38°23'00", Long. 106°15'00", diverts water from tributaries of Tomichi Creek between headgates (in sec. 11, T.48 N., R.6 E., and sec. 1, T.47 N., R.6 E.), and Marshall Pass, in Gunnison River Basin, to Poncha Creek (tributary to South Arkansas River) in SE ¼ sec. 24, T.48 N., R.6 E., in Arkansas River Basin.
Drainage and Period of Record.--	N/A
Equipment.--	High data rate Sutron SatLink Logger DCP and shaft encoder with an SDR recorder in a 36-in x 36-in metal shelter and well. Shaft encoder and SDR are set to outside staff gage. Control is a 2-foot steel Parshall flume.
Hydrologic Conditions.--	The ditch was built in 1939, and diverts water from Hurry Creek, from north of the west side of Marshall Pass, approximately 3 miles west of Poncha Pass. The ditch crosses Marshall Pass at an elevation of 10,900 feet, and delivers water to Poncha Creek, a tributary of the South Arkansas River. The ditch runs approximately 1.5 miles. The basin consists primarily of high mountain terrain, most of which is above tree line with little to no development. No hydraulic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with SDR data used for backup purposes. The record is complete and reliable for the seasonally operated gage except for Oct 1-3, 6-18, 20, 2009 when the flume was affected by ice.
Datum Corrections.--	Levels were last run July 25, 2006 and no corrections were made at that time.
Rating.--	A standard, 2 ft. Parshall flume table (STD02FTPF) was used for the entire water year. Three discharge measurements, Nos. 50-52, were made during the water year. The minimum daily flow was 0 cfs on many days. Mean daily flows exceeded high flow measurement No. 51 on May 26-31, June 1-14, July 30, 31 Aug 1, 2, 2010; and was below measurement No. 50 Oct 1-3, 5-14, 16-21, 2009 July 13-25, Aug 14, 15, 18, 21-28, 31, Sept 1-7, 9-21, 24-30, 2010. The peak discharge of 14.1 cfs occurred at 1900 July 30, 2010 at a gage height of 1.45 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 51 by 1.10 ft.
Discharge.--	Measurements are made from a walkway across the flume at a position where the meter axis is parallel with the staff gage and well intake. Measurement #50 was adjusted by 8%. Discharge was computed by applying the rating directly to the gage height record with a shift of 0.00 ft
Special Computations.--	Ice affected days were determined using printed chart data, ice affected gage height spikes were smoothed using chart data and averages for the day.
Remarks.--	This year's peak gage height occurred during an early evening rain storm making it difficult to acquire a measurement near the peak. Given the high elevation conditions and lack of site visits the record is considered fair, except ice affected days which are considered poor. Station maintained and record developed by Cheston Hart.
Recommendations.--	There should be a better attempt to get a high flow measurements to find if a variable curve should be used.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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LARKSPUR DITCH AT MARSHALL PASS

RATING TABLE--

STD02FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.34	0	0	0	0	0	0	0	2.6	0.53	1.8	0.3
2	0.26	0	0	0	0	0	0	0	2.3	0.69	1.6	0.29
3	0.35	0	0	0	0	0	0	0	2.3	0.86	1.2	0.28
4	0.46	0	0	0	0	0	0	0	2.7	0.59	0.91	0.27
5	0.37	0	0	0	0	0	0	0	2.9	0.53	0.73	0.27
6	0.29	0	0	0	0	0	0	0	2.9	0.48	0.58	0.26
7	0.37	0	0	0	0	0	0	0	2.8	0.51	0.54	0.28
8	0.38	0	0	0	0	0	0	0	2.5	0.56	0.53	0.53
9	0.33	0	0	0	0	0	0	0	2.4	0.48	0.55	0.36
10	0.33	0	0	0	0	0	0	0	2.1	0.43	0.48	0.31
11	0.34	0	0	0	0	0	0	0	1.9	0.42	0.46	0.32
12	0.33	0	0	0	0	0	0	0	2.1	0.42	0.65	0.31
13	0.33	0	0	0	0	0	0	0	1.8	0.36	0.45	0.29
14	0.38	0	0	0	0	0	0	0	1.6	0.34	0.37	0.28
15	0.51	0	0	0	0	0	0	0	1.5	0.3	0.35	0.27
16	0.33	0	0	0	0	0	0	0	1.3	0.27	0.47	0.27
17	0.31	0	0	0	0	0	0	0	1.2	0.27	0.48	0.27
18	0.34	0	0	0	0	0	0	0	1.1	0.27	0.34	0.26
19	0.39	0	0	0	0	0	0	0	0.98	0.26	0.39	0.25
20	0.33	0	0	0	0	0	0	0	0.92	0.3	0.41	0.26
21	0.04	0	0	0	0	0	0	0	0.86	0.6	0.33	0.27
22	0	0	0	0	0	0	0	0	0.79	0.43	0.33	0.58
23	0	0	0	0	0	0	0	0	0.73	0.33	0.33	0.69
24	0	0	0	0	0	0	0	0.94	0.67	0.31	0.33	0.38
25	0	0	0	0	0	0	0	1.4	0.75	0.36	0.35	0.33
26	0	0	0	0	0	0	0	1.8	0.8	0.43	0.29	0.31
27	0	0	0	0	0	0	0	2.9	0.71	0.44	0.28	0.3
28	0	0	0	0	0	0	0	3.6	0.68	0.4	0.34	0.29
29	0	0	0	0	---	0	0	3.6	0.73	0.49	0.39	0.29
30	0	0	0	0	---	0	0	3	0.62	2.4	0.45	0.28
31	0	---	0	0	---	0	---	2.7	---	1.9	0.36	---
TOTAL	7.11	0.00	0.00	0.00	0.00	0.00	0.00	19.94	47.24	16.96	17.07	9.65
MEAN	0.23	0	0	0	0	0	0	0.64	1.57	0.55	0.55	0.32
AC-FT	14	0	0	0	0	0	0	40	94	34	34	19
MAX	0.51	0	0	0	0	0	0	3.6	2.9	2.4	1.8	0.69
MIN	0	0	0	0	0	0	0	0	0.62	0.26	0.28	0.25

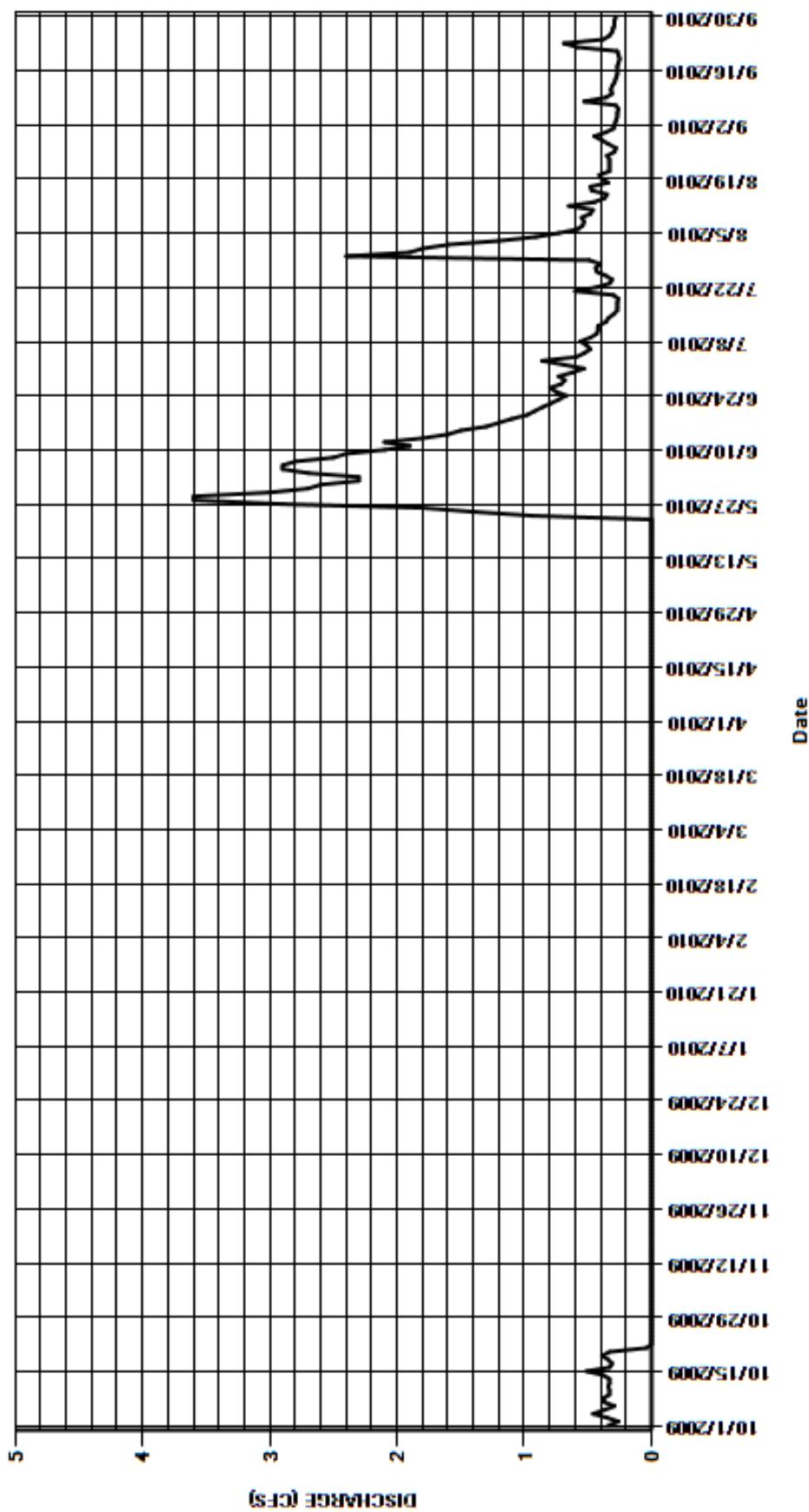
CAL YR	2009	TOTAL	189.09	MEAN	0.52	MAX	4.3	MIN	0	AC-FT	375
WTR YR	2010	TOTAL	117.97	MEAN	0.32	MAX	3.6	MIN	0	AC-FT	234

MAX DISCH: 14.2 CFS AT 19:00 ON Jul. 30,2010 GH 1.45 FT. SHIFT 0 FT.

MAX GH: 1.45 FT. AT 19:00 ON Jul. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LARKSPUR DITCH AT MARSHALL PASS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
Water Year 2010

Location.-- Lat. $37^{\circ}43'29''$, Long. $107^{\circ}15'18''$, UTM X 301212.5, Y 4177667.8, in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, T.40 N., R.4 W., Hinsdale County, Hydrologic Unit 13010001, on right bank 70 ft downstream from bridge, 500 ft upstream from Squaw Creek, 0.7 mi downstream from Rio Grande Reservoir, and 20 mi southwest of Creede.

Drainage and Period of Record.-- 163 mi 2 . June 1909 to Sep. 1923, May 1925 to current year. No winter records 1910, 1926. Monthly data only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 3 ft. by 3 ft. timber shelter and corrugated metal well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The cableway is located 21 feet upstream of gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 6-8, 2009 when the station was isolated, April 2-7, 2010 when the well was frozen, and Nov. 9, 2009 to March 16, 2010 when the station was closed for the winter. There were three instrumentation corrections made to the shaft encoder. A +0.13 ft. correction on Apr. 7 due to loss of oil from the oil cylinder was taken straight back to the reduction of the release from the reservoir to estimate the flows for the period. A -0.01 ft. correction on Aug. 5 and a +0.01 ft. correction on Sep. 8 were prorated by time from previous visits.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage July 23, 2010 using R. M. No. 2 as base. The RP elevation was within allowable limits, but the tape length was adjusted +0.004 ft to match the historic RP elevation. No actual correction was carried back due to the small correction. Two-peg tests were performed on the Lietz level (SN 130869) on July 13 and August 26, 2010. No adjustment to instrument collimation was made.

Rating.-- Control is a boulder and cobble channel. Scour, fill and moss growth cause shifting. Rating No. 12, in use since Oct. 1, 1994, was used again this year. The rating is well defined from 8 to 2500 cfs. Fifteen measurements (Nos. 831-845) were made this year ranging in discharge from 3.45 to 1120 cfs. They cover the range of daily flows experienced, except for the higher daily flows on May 29-31, June 6 and 7, 2010. The peak flow of 1200 cfs occurred at 2130 on May 29, 2010 at a gage height of 3.66 feet with a shift of -0.01 feet. It exceeded high measurement No. 839 made at a GH of 3.58 ft., made May 18, 2010 by 0.08 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.07 and +0.03 feet. All were given full weight except for Nos. 831, 834, 835, 838, 840, and 843, which were adjusted by as much as 5% to smooth shift distribution.

Special Computations.-- Discharge when station isolated and closed for the winter was estimated using simple proration between measurements at closing and opening station. There was no change in reservoir release gates during the period, so change in flow is attributed to increased reservoir elevation. Discharge for period of no gage-height record due to the well being frozen (Apr. 2-7, 2010) was estimated using one measurement and partial day records with correction applied. A hydrograph was not used for estimation since flow is regulated by Rio Grande Reservoir 0.7 mile upstream.

Remarks.-- Record is good except for periods of no gage-height record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE

RATING TABLE--

RIOMILCO12 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	31	3.8	4.1	4.5	4.8	196	166	1090	171	192	88
2	40	33	3.8	4.2	4.5	4.8	80	141	1010	165	136	70
3	33	42	3.8	4.2	4.5	4.8	9.1	100	870	166	84	66
4	27	46	3.8	4.2	4.5	4.8	5.8	83	803	183	120	60
5	52	44	3.8	4.2	4.5	4.8	5.8	278	1020	161	171	56
6	68	18	3.8	4.2	4.5	4.8	43	461	1160	128	195	56
7	58	3.4	3.8	4.2	4.6	4.9	41	436	1170	82	137	50
8	55	3.4	3.9	4.2	4.6	4.9	14	405	1060	82	80	46
9	54	3.4	3.9	4.2	4.6	4.9	27	599	980	115	81	74
10	50	3.5	3.9	4.2	4.6	4.9	63	698	959	128	92	92
11	41	3.5	3.9	4.2	4.6	4.9	77	707	830	145	95	68
12	32	3.5	3.9	4.3	4.6	4.9	146	583	704	116	108	57
13	34	3.5	3.9	4.3	4.6	4.9	191	448	442	81	163	55
14	52	3.5	3.9	4.3	4.6	4.9	106	386	188	74	145	51
15	50	3.6	3.9	4.3	4.7	4.9	113	420	167	74	86	54
16	39	3.6	4	4.3	4.7	28	189	513	338	74	54	51
17	41	3.6	4	4.3	4.7	65	263	895	394	69	76	43
18	48	3.6	4	4.3	4.7	75	288	1100	321	67	122	37
19	50	3.6	4	4.3	4.7	86	275	768	265	62	99	34
20	55	3.6	4	4.3	4.7	98	320	461	237	63	74	44
21	58	3.7	4	4.4	4.7	112	428	667	228	80	79	57
22	58	3.7	4	4.4	4.7	126	468	1030	210	103	78	61
23	45	3.7	4	4.4	4.7	154	341	948	200	129	67	94
24	34	3.7	4.1	4.4	4.7	191	237	725	193	114	58	134
25	35	3.7	4.1	4.4	4.8	211	193	418	206	92	62	90
26	37	3.7	4.1	4.4	4.8	213	182	344	224	89	76	63
27	37	3.7	4.1	4.5	4.8	213	195	725	202	85	76	67
28	37	3.7	4.1	4.5	4.8	214	271	1080	179	83	72	63
29	36	3.8	4.1	4.5	---	215	312	1180	175	90	65	57
30	32	3.8	4.1	4.5	---	228	239	1180	165	114	61	47
31	29	---	4.1	4.5	---	231	---	1140	---	165	89	---
TOTAL	1359	300.5	122.6	133.7	130.0	2532.9	5318.7	19085	15990	3350	3093	1885
MEAN	43.8	10	3.95	4.31	4.64	81.7	177	616	533	108	99.8	62.8
AC-FT	2700	596	243	265	258	5020	10550	37860	31720	6640	6130	3740
MAX	68	46	4.1	4.5	4.8	231	468	1180	1170	183	195	134
MIN	27	3.4	3.8	4.1	4.5	4.5	4.8	5.8	83	165	62	54

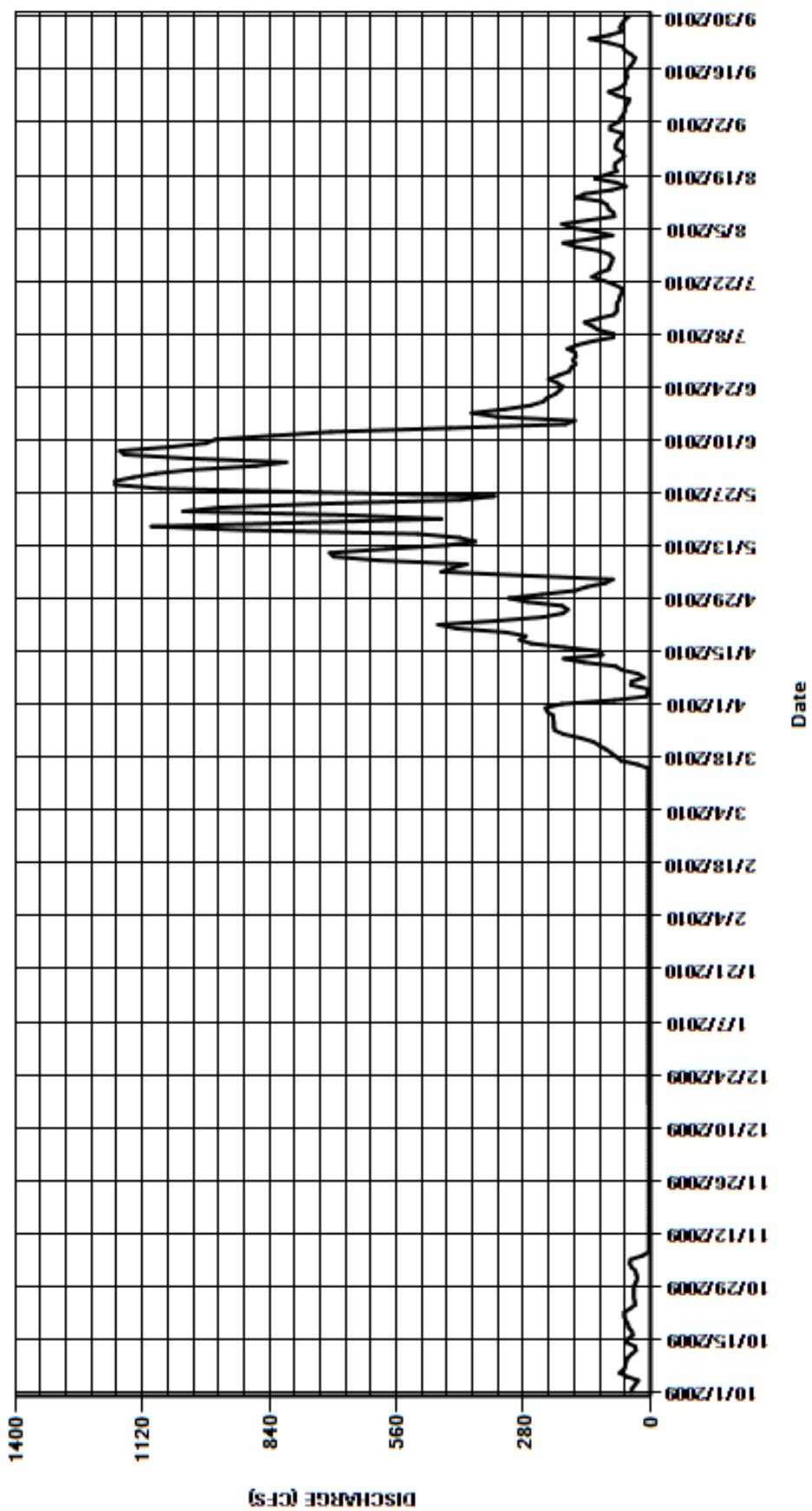
CAL YR	2009	TOTAL	65270.0	MEAN	179	MAX	1200	MIN	3.4	AC-FT	129500
WTR YR	2010	TOTAL	53300.4	MEAN	146	MAX	1180	MIN	3.4	AC-FT	105700

MAX DISCH: 1200 CFS AT 21:30 ON May. 29,2010 GH 3.66 FT. SHIFT -0.01 FT.

MAX GH: 3.66 FT. AT 21:30 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
Water Year 2010

Location.-- Lat. 37°53'18", Long. 107°12'10", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, T.42 N., R.3 W., Hinsdale County, Hydrologic Unit 13010001, on left bank 100 ft downstream from bridge, 1,000 ft downstream from Continental Reservoir, and 15 mi west of Creede.

Drainage and Period of Record.-- 51.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. by 4 ft. timber shelter and concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 9, 2009 through Apr. 22, 2010 when the station was closed for the winter. There was a -0.01 ft shaft encoder correction on Jun. 4, 2010, which was prorated by time from previous visit.

Datum Corrections.-- Levels were not run this year. Levels were last run on Aug. 19, 2009 using R.M. No. 4 as base. The RP was within allowable limits so no correction was made.

Rating.-- The control is a concrete ramp flume. There is a two foot wide notch in the middle of the ramp to provide more sensitivity at very low flows. Rating No. 23 was used again this year. It is well defined from 0 to 300 cfs. Eleven measurements (Nos. 789-799) were made this year ranging in discharge from 0.13 to 267 cfs. The measurements cover the range experienced except for the higher daily flows on June 17 and 18, 2010. The peak flow of 296 cfs occurred at 1230 on June 17, 2010 at a gage height of 3.19 feet with a shift of 0 feet. It exceeded high measurement No. 795 (GH = 3.04), made June 18, 2010 by 0.15 feet in stage.

Discharge.-- Shifting control method was used for all good record periods. Shifts were applied as defined by measurements and were distributed by time. The minus shifts that occur are due to the moss building on control. Measurements show shifts varied from -0.05 to +0.05 ft. All shifts were given full weight except Nos. 795 and 797, which were adjusted by as much as 6%, to smooth shift distribution. Measurement number 795, the high measurement of the water year, was adjusted due to the fact that the measurement trend shows the rating is accurate. There were two measurements analyzed from the previous water year at similar gage heights that also confirm that the rating is accurate at the upper end.

Special Computations.-- Discharge for period of winter no gage-height record was estimated using two measurements and simple proration from station close to before reservoir operations started. There was no change in reservoir gates during the period.

Remarks.-- Record is good except for periods of no gage-height record which are poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR

RATING TABLE--

NCLCONCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

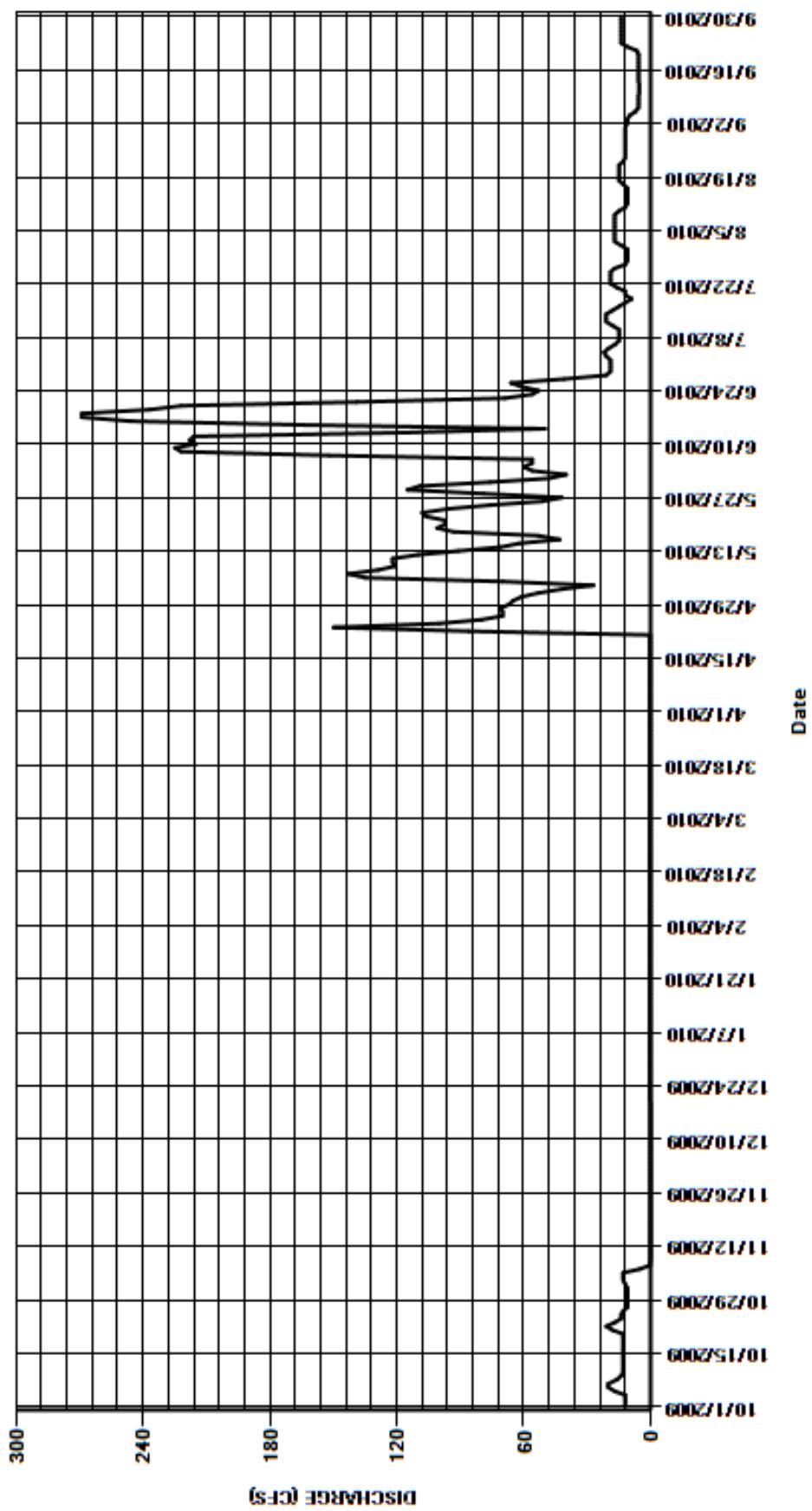
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	11	0.13	0.14	0.15	0.16	0.17	61	48	19	14	12
2	12	12	0.13	0.14	0.15	0.16	0.17	53	40	19	17	11
3	12	13	0.13	0.14	0.15	0.16	0.17	42	56	21	17	11
4	12	13	0.13	0.14	0.15	0.16	0.17	27	60	22	17	10
5	17	13	0.13	0.14	0.15	0.16	0.17	70	56	20	17	7.3
6	20	5	0.13	0.14	0.15	0.16	0.17	135	56	17	17	5.8
7	20	0.2	0.13	0.14	0.15	0.16	0.17	143	152	15	17	5.7
8	16	0.18	0.13	0.14	0.15	0.16	0.17	129	222	15	17	5.7
9	14	0.13	0.13	0.14	0.15	0.16	0.17	121	225	15	17	5.7
10	13	0.13	0.13	0.14	0.15	0.16	0.17	122	215	15	15	5.5
11	13	0.13	0.13	0.14	0.15	0.16	0.17	122	218	18	12	5.4
12	13	0.13	0.13	0.14	0.15	0.16	0.17	110	216	21	11	5.4
13	13	0.13	0.13	0.14	0.16	0.16	0.17	91	114	21	11	5.7
14	13	0.13	0.13	0.14	0.16	0.16	0.17	71	50	21	11	5.7
15	13	0.13	0.13	0.14	0.16	0.16	0.17	62	164	18	11	5.7
16	13	0.13	0.13	0.14	0.16	0.16	0.17	43	246	15	11	5.7
17	13	0.13	0.13	0.14	0.16	0.17	0.17	53	269	12	13	5.7
18	13	0.13	0.13	0.14	0.16	0.17	0.17	93	269	8.9	15	5.7
19	13	0.13	0.13	0.14	0.16	0.17	0.17	101	237	12	15	5.7
20	13	0.13	0.14	0.14	0.16	0.17	0.17	97	222	12	15	5.7
21	18	0.13	0.14	0.14	0.16	0.17	0.17	97	139	16	15	6.6
22	21	0.13	0.14	0.14	0.16	0.17	86	106	69	19	15	11
23	17	0.13	0.14	0.14	0.16	0.17	150	108	56	19	13	14
24	14	0.13	0.14	0.14	0.16	0.17	100	96	53	19	12	14
25	14	0.13	0.14	0.14	0.16	0.17	80	76	61	19	12	14
26	13	0.13	0.14	0.14	0.16	0.17	70	51	66	17	12	14
27	11	0.13	0.14	0.14	0.16	0.17	70	42	41	12	12	14
28	11	0.13	0.14	0.14	0.16	0.17	71	79	21	11	12	14
29	11	0.13	0.14	0.14	---	0.17	67	115	19	11	12	14
30	11	0.13	0.14	0.15	---	0.17	65	109	19	11	12	14
31	11	---	0.14	0.15	---	0.17	---	76	---	11	12	---
TOTAL	430	70.24	4.15	4.36	4.36	5.11	762.57	2701	3679	501.9	429	265.7
MEAN	13.9	2.34	0.13	0.14	0.16	0.16	25.4	87.1	123	16.2	13.8	8.86
AC-FT	853	139	8.2	8.6	8.6	10	1510	5360	7300	996	851	527
MAX	21	13	0.14	0.15	0.16	0.17	150	143	269	22	17	14
MIN	11	0.13	0.13	0.14	0.15	0.16	0.17	27	19	8.9	11	5.4
CAL YR	2009	TOTAL	9894.42	MEAN	27.1	MAX	262	MIN	0.13	AC-FT	19630	
WTR YR	2010	TOTAL	8857.39	MEAN	24.3	MAX	269	MIN	0.13	AC-FT	17570	

MAX DISCH: 296 CFS AT 12:30 ON Jun. 17,2010 GH 3.19 FT. SHIFT 0 FT.

MAX GH: 3.19 FT. AT 12:30 ON Jun. 17,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
Water Year 2010

Location.-- Lat. 37°46'01", Long. 106°49'51", UTM X 338690.6, Y 4181536.9, in NW1/4 NE1/4 sec. 35, T. 41N, R. 1E., Mineral County, Hydrologic unit 13010001, on left bank 40 ft. downstream from private bridge, 0.3 mi. upstream from Goose Creek, and 0.3 mi. west of town of Wagonwheel Gap.

Drainage and Period of Record.-- 780 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. by 4 ft. timber shelter with a 4 ft. diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. An outside staff gage was installed this WY. The cableway is located 350 feet above gaging station.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 25, 2009 through Mar. 30, 2010 when the station was closed for the winter and April 2-7 when the well froze back after opening. The stage-discharge relation was affected by ice Nov. 18-24, 2009, March 31, 2010 and April 1, 2010. There were two instrumentation corrections made to the shaft encoder, a -0.01 ft and a +0.02 ft. These corrections were prorated by time from previous visits. There was a flush correction of 0.03 ft that was run back to the last point of inflection.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside gage on Aug. 6, 2010 using B.M. No. 4 as base. The RP was within allowable limits therefore no correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on July 13 and August 26, 2010.

Rating.-- Low and medium water control is a wide cobble bar approximately 250 feet below the gage. High water control is the island in the river channel approximately 350 feet below the gage. Rating No. 5 was created and used this water year. It was created to better utilize recent measurements and allow for less shifting at the upper end. It is well defined from 90 to 3450 cfs. Eighteen measurements (No. 146 to 163) were made this year, ranging in discharge from 79.5 to 2250 cfs. They cover the range experienced except for the lower daily flows on Nov 17, Dec 4, 5, 10, 11, 27-29 2009, Jan 7-16, 20-31, Feb 1-4, 10, 24, 25 2010. The peak flow of 3350 cfs occurred at 0530 on May 29, 2010 at a gage height of 4.36 ft. with a shift of 0 ft. The peak flow exceeded high measurement No. 156 (GH = 3.72), made May 18, 2010, by 0.64ft. in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.06 and +0.05 feet. All measurements were given full weight and applied except Nos. 146, 148, 153, 155, 158, 161, 162 and 163, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height record was based on four measurements, partial day records, comparison with Rio Grande near Del Norte and South Fork Rio Grande near South Fork gages, and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which should be considered poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP

RATING TABLE--

RIOWAGCO05 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

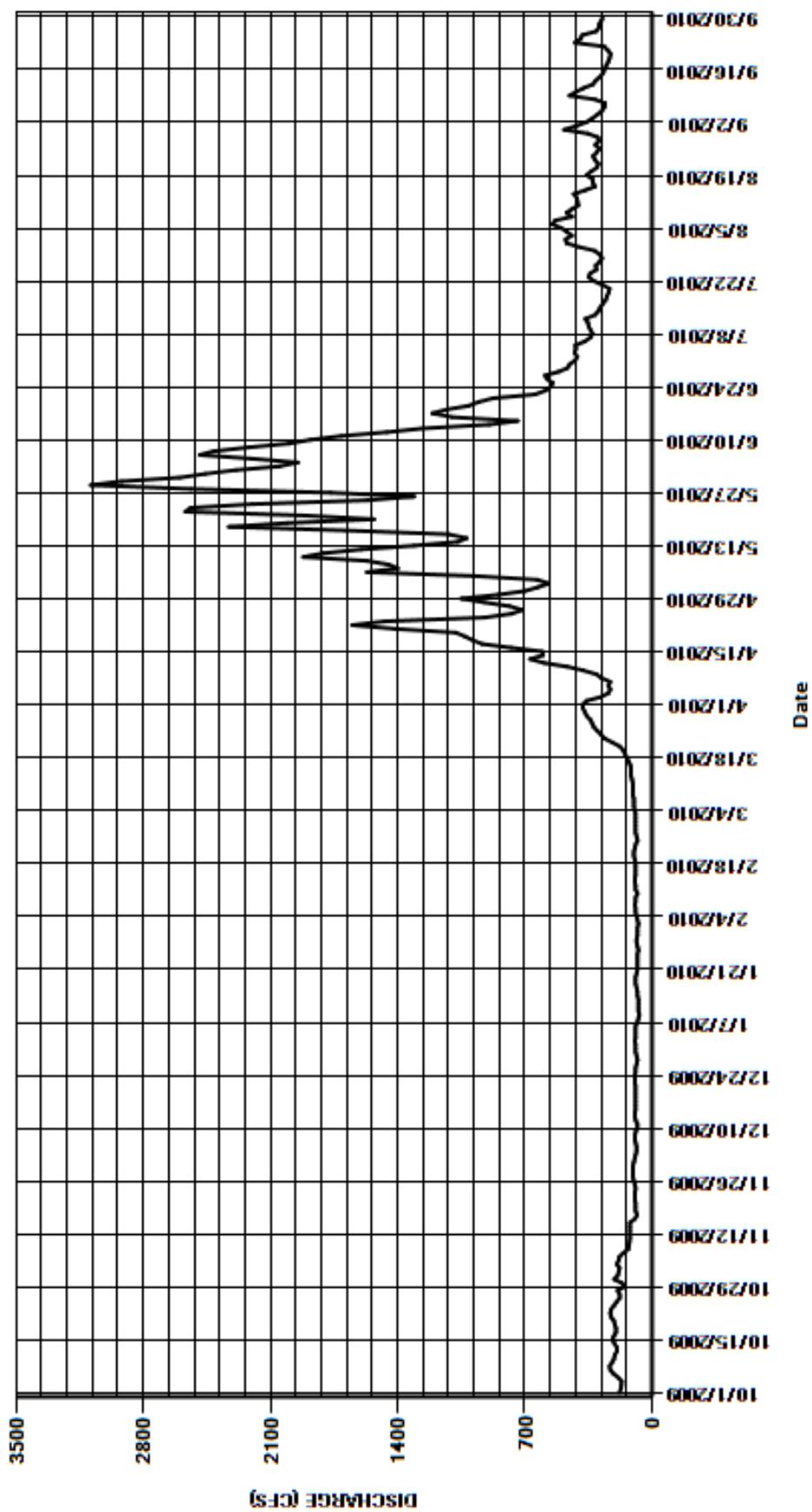
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	181	189	100	90	80	90	380	701	2460	423	470	417
2	172	183	95	95	75	90	360	629	2290	412	477	362
3	169	179	90	90	80	90	280	567	2050	427	441	329
4	167	194	85	90	85	95	240	633	1950	420	469	300
5	186	184	85	90	90	100	230	982	2200	422	500	276
6	212	179	90	90	90	100	240	1570	2490	371	549	262
7	230	156	95	80	95	100	230	1400	2410	340	533	258
8	234	130	95	75	90	105	279	1450	2220	327	440	313
9	220	128	90	70	90	105	307	1570	2000	339	471	455
10	209	124	80	75	80	105	379	1920	1880	349	441	419
11	205	122	80	75	90	105	468	1810	1710	353	406	378
12	193	122	90	75	90	110	596	1600	1460	367	411	325
13	194	122	95	75	95	115	671	1310	1260	314	414	310
14	207	122	95	80	95	115	600	1070	898	296	431	286
15	218	121	90	80	90	115	604	1020	740	286	368	269
16	210	94	90	85	90	120	775	1120	1100	270	313	262
17	198	82	90	90	90	130	936	1680	1210	255	326	252
18	198	90	90	90	90	140	987	2330	1130	248	328	241
19	205	90	90	90	95	150	1030	2010	1010	239	361	233
20	210	90	90	85	100	160	1080	1530	955	234	334	228
21	225	95	90	80	100	180	1410	1920	872	275	303	243
22	230	95	95	80	95	220	1650	2570	644	320	296	263
23	226	95	95	80	90	260	1470	2540	587	349	314	425
24	210	90	95	80	80	280	922	2200	559	341	325	395
25	196	95	90	80	85	300	774	1570	546	305	305	385
26	178	100	90	75	90	320	712	1310	576	311	289	308
27	178	105	85	80	90	330	786	1770	590	290	313	293
28	190	105	80	85	90	340	923	2540	514	275	293	290
29	153	105	85	85	---	360	1050	3090	465	288	298	277
30	165	105	90	80	---	370	849	2920	453	316	354	272
31	209	---	90	80	---	380	---	2600	---	403	485	---
TOTAL	6178	3691	2790	2555	2500	5580	21218	51932	39229	10165	12058	9326
MEAN	199	123	90	82.4	89.3	180	707	1675	1308	328	389	311
AC-FT	12250	7320	5530	5070	4960	11070	42090	103000	77810	20160	23920	18500
MAX	234	194	100	95	100	380	1650	3090	2490	427	549	455
MIN	153	82	80	70	75	90	230	567	453	234	289	228
CAL YR	2009	TOTAL	186233	MEAN	510	MAX	3370	MIN	80	AC-FT	369400	
WTR YR	2010	TOTAL	167222	MEAN	458	MAX	3090	MIN	70	AC-FT	331700	

MAX DISCH: 3350 CFS AT 05:30 ON May. 29,2010 GH 4.36 FT. SHIFT 0 FT.

MAX GH: 4.36 FT. AT 05:30 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08218500 GOOSE CREEK AT WAGONWHEEL GAP
Water Year 2010

Location.-- Lat. 37°45'07", Long. 106°49'46", UTM X 338780.4, Y 4179870.1, in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, T.41 N., R.1 E., Mineral County, Hydrologic Unit 13010001, on left bank 1/4 mile downstream from Pierce Creek, 1 mile upstream from mouth, 1 mile south of Wagon Wheel Gap, and 8 3/4 miles southeast of Creede.

Drainage and Period of Record.-- 90 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 36-inch corrugated metal pipe shelter. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 19-24, 2009 when float was affected by ice in oil cylinder and Nov. 25, 2009 through Mar. 30, 2010 when the station was closed for winter. Stage-discharge relation was affected by ice Oct. 30, Nov. 16-18, 2009, and Apr. 2, 3, 2010. There were three instrument corrections made to the shaft encoder. A +0.01 ft and -0.02 ft correction were prorated back to the previous measurement and a +0.04 ft correction was ran straight back to when the oil cylinder overtopped, May 20, 2010 between 22:00 and 23:00 identified by comparison with chart record.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 6, 2010 using B.M. 2 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made. Two-peg tests were performed on the Lietz level (SN 130869) on July 13 and August 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- Control is a rock and boulder riffle just downstream from the gage. Willows along banks influence high stages. Scouring, filling, and moss cause shift variations. Rating No. 10-1 was created in WY 2009. The rating is well defined from 20 to 330 cfs. The rating was re-evaluated at the upper and lower end. There was a change between 2004 and 2005 that caused the rating to shift negative off historic ratings. Seventeen measurements (Nos. 45-61) were made this year ranging in discharge from 12.6 to 273 cfs. They cover the range of flow experienced except for lower daily flows on Jan. 30, Feb. 1-18, 22, 23, 2009; and the higher daily flows on May 28-31, and June 1, 2, 4-10, 2010. The peak flow of 450 cfs occurred at 0045 on May 29, 2010 at a gage height of 4.00 feet with a shift of -0.02 feet. It exceeded high measurement No. 56 (GH=3.58), made June 1, 2010 by 0.42 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied from -0.06 to +0.01 ft. All open water measurements were given full weight except No's. 45, 53, 54, 55, 58 and 60, which were adjusted as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six discharge measurements and air temperature record from South Fork Rio Grande River at South Fork (RIOSFKCO).

Remarks.-- Record is good to fair except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08218500 GOOSE CREEK AT WAGONWHEEL GAP

RATING TABLE--

GOOWAGCO10-1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

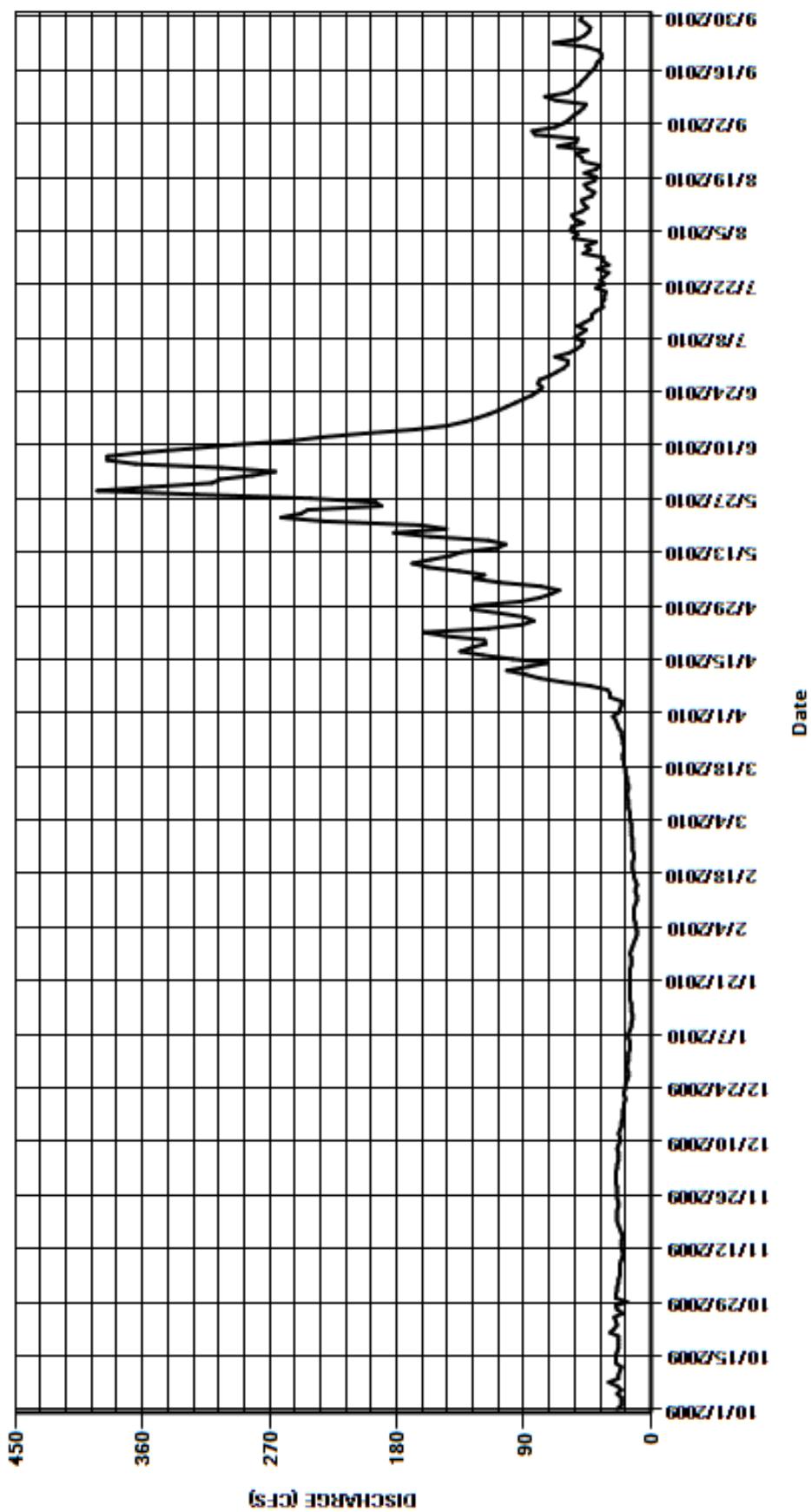
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	24	25	16	11	14	23	79	305	59	46	68
2	21	24	25	16	10	14	22	71	282	59	39	62
3	21	23	24	15	10	14	21	65	266	68	55	58
4	21	23	24	15	11	15	21	78	304	58	52	55
5	24	22	23	15	11	15	29	107	365	53	57	51
6	21	22	23	16	12	15	29	125	385	49	56	48
7	24	22	23	16	12	16	31	118	385	48	48	46
8	30	22	24	15	12	16	43	136	359	54	54	67
9	23	21	23	14	12	16	63	158	327	50	56	75
10	23	20	22	14	11	17	79	169	295	46	49	59
11	22	20	22	13	10	17	89	156	256	52	45	55
12	21	21	23	13	10	16	102	142	233	47	48	51
13	25	21	22	14	11	16	87	134	202	42	49	49
14	25	21	21	14	11	17	73	109	167	42	42	46
15	25	20	21	14	10	17	98	103	144	39	40	44
16	24	21	20	15	11	18	119	115	132	34	45	41
17	23	22	20	15	12	18	135	156	123	35	47	39
18	23	23	20	15	12	19	127	182	115	33	40	38
19	23	24	19	15	13	19	117	145	108	33	39	35
20	23	24	19	15	13	20	118	163	102	32	47	35
21	29	24	18	15	13	20	145	231	96	39	39	37
22	26	24	19	15	12	19	161	262	90	33	36	46
23	24	23	19	15	12	19	115	248	84	36	48	69
24	25	23	18	15	13	20	91	243	80	33	49	52
25	26	24	18	14	13	20	83	191	77	30	53	47
26	20	24	17	14	13	21	90	195	80	38	45	44
27	24	24	16	14	13	21	107	241	79	30	66	43
28	25	24	16	15	14	23	127	322	72	34	53	46
29	17	25	17	14	---	24	126	392	67	34	52	50
30	25	25	17	13	---	25	93	354	62	48	82	49
31	25	---	16	12	---	27	---	311	---	43	84	---
TOTAL	732	680	634	451	328	568	2564	5501	5642	1331	1561	1505
MEAN	23.6	22.7	20.5	14.5	11.7	18.3	85.5	177	188	42.9	50.4	50.2
AC-FT	1450	1350	1260	895	651	1130	5090	10910	11190	2640	3100	2990
MAX	30	25	25	16	14	27	161	392	385	68	84	75
MIN	17	20	16	12	10	14	21	65	62	30	36	35
CAL YR	2009	TOTAL	23229	MEAN	63.6	MAX	396	MIN	12	AC-FT	46070	
WTR YR	2010	TOTAL	21497	MEAN	58.9	MAX	392	MIN	10	AC-FT	42640	

MAX DISCH: 450 CFS AT 00:45 ON May. 29,2010 GH 4 FT. SHIFT -0.02 FT.

MAX GH: 4 FT. AT 00:45 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08218500 GOOSE CREEK AT WAGONWHEEL GAP
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
Water Year 2010

Location.-- Lat. 37°39'25", Long. 106°38'55", UTM X 354526.8, Y 4169033.0, in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T.39 N., R.3 E., Rio Grande County, Hydrologic Unit 13010001, on left bank near U.S. Highway 160, 0.1 mile downstream from Church Creek, 0.9 mi southwest of town of South Fork, and 1.5 mi upstream from mouth.

Drainage and Period of Record.-- 216 mi². Station established May 17, 1909 at different site with minimal records. Non-recording to 1910 when water-stage recorder installed. Moved to current site in May 1936

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, air temperature sensor, and tipping-bucket rain gauge in a timber shelter and corrugated metal pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway is located 475 feet upstream. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except Nov. 25, 2009 through Mar. 31, 2010 when the station was closed for the winter. Stage-discharge relation was affected by ice Nov. 16-24, 2009. There were no instrumentation corrections made to the shaft encoder.

Datum Corrections.-- Levels were run on August 6, 2010 to the Reference Point (RP) inside the gage using BM #7 as base. The RP elevation was correct, but the nonadjustable tape length was 0.02 ft too long. Therefore the RP was adjusted to match the tape length, resulting in a -0.02 ft datum correction. The correction was distributed back to March 31, 2010 when the station was opened. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- A cobble bar approximately 250 feet downstream from the gage is the control. This cobble bar results in a significant flow split at higher gage heights. Shifting is caused by channel scour and fill and also vegetation and debris deposition associated with the cobble bar island. Rating No. 11 was used again this year. The slope of the rating in log-log space indicates that section control governs discharge at most stages. It is fairly well defined from 34 to 2700 cfs. Seventeen measurements (Nos. 244-260) were made this year ranging in discharge from 35.3 to 1,090 cfs. They cover the discharge range experienced except for higher daily flows on May 22-24, 28-30, 2010. The peak flow of 1510 cfs occurred at 2200 on May 31, 2010 at a gage height of 5.17 feet with a shift of -0.01 feet and datum correction of -0.02 ft. It exceeded high measurement No. 253 (GH=4.55), made May 24, 2010 by 0.62 feet in stage.

Discharge.-- Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between -0.02 ft. and 0.10 ft. All were given full weight and applied, except Nos. 254, 255, 258 and 261 which were adjusted as much as 8% to smooth shift distribution. All adjusted measurements were adjusted positively because the adjacent measurements optimum shifts were used, thus resulting in the adjustment of fewer measurements. Measurement 254 is suspect because of meter problems discovered after the measurement; however, a check measurement showing similar trend was made and given more weight.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated based on five measurements, comparison with flows at Rio Grande near Del Norte (RIODELCO), and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK

RATING TABLE--

RIOSFKCO11 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

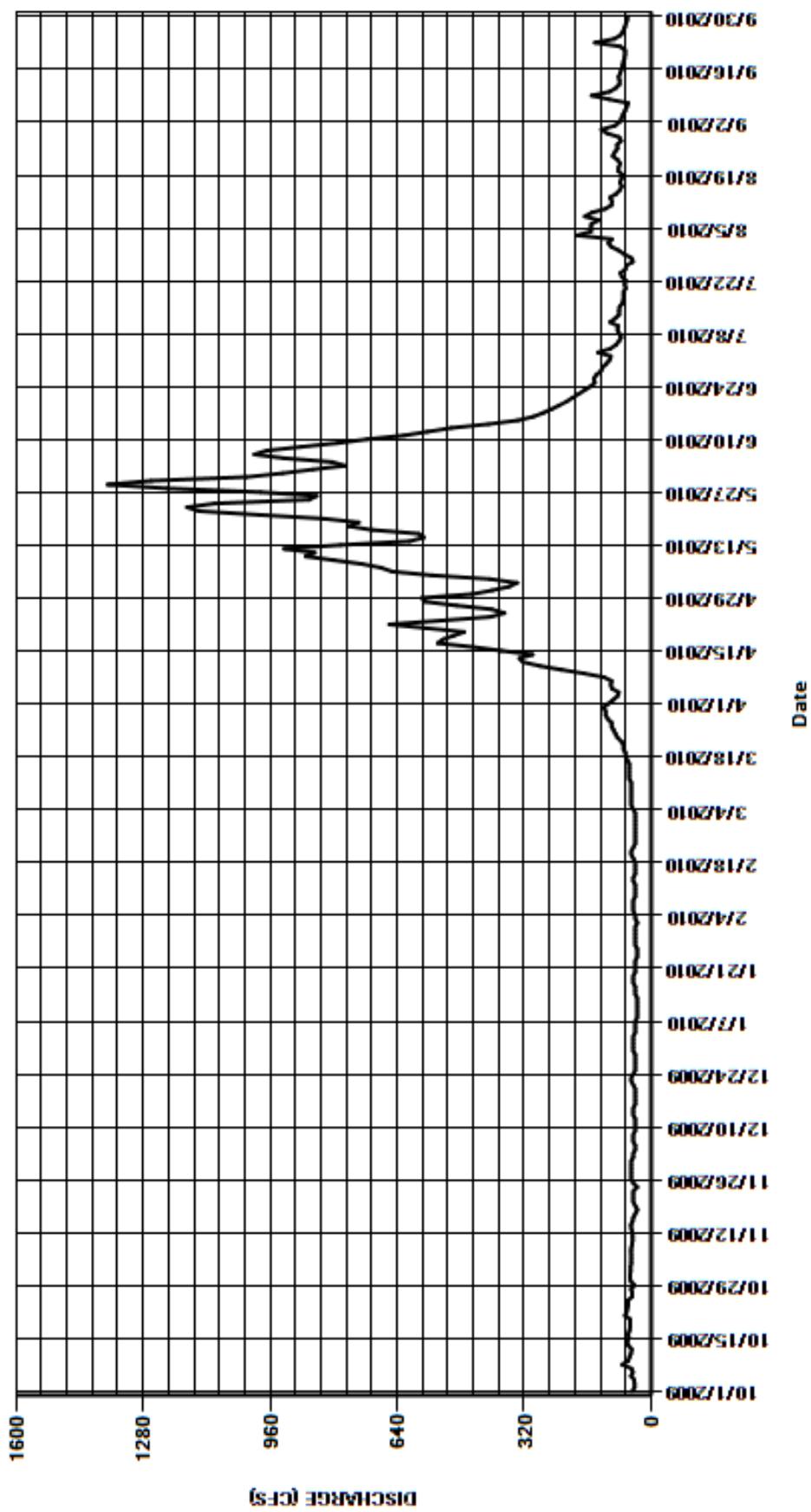
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	53	50	45	40	40	108	401	929	105	108	92
2	42	52	45	45	35	40	96	358	853	102	99	80
3	42	52	45	45	40	40	85	338	772	134	186	75
4	43	50	40	40	40	45	82	407	805	103	152	71
5	51	50	40	40	45	50	99	553	925	89	152	66
6	46	50	45	40	45	50	102	653	1000	81	151	62
7	50	51	45	40	45	50	100	681	969	76	132	58
8	73	50	45	35	45	50	119	730	882	81	167	106
9	58	48	40	35	40	50	170	800	790	85	150	150
10	55	47	40	35	40	50	227	871	716	83	116	105
11	51	47	40	35	40	50	281	848	623	104	100	89
12	49	48	40	35	40	55	323	925	564	91	99	80
13	57	50	45	35	45	55	332	783	504	81	104	80
14	61	51	45	40	45	55	299	609	411	81	88	82
15	57	47	45	40	40	55	377	573	336	80	79	78
16	58	45	40	40	40	55	449	586	297	73	74	75
17	55	40	40	45	40	60	538	704	272	70	79	72
18	53	35	40	45	40	65	525	762	251	70	75	70
19	53	40	40	45	45	65	498	737	232	70	72	67
20	53	45	40	40	50	70	471	826	213	64	83	66
21	66	45	45	40	50	70	567	988	198	67	82	66
22	62	45	50	40	45	75	660	1140	183	64	78	78
23	60	45	50	40	40	85	530	1170	168	74	85	142
24	58	35	45	35	40	90	404	1100	153	78	97	93
25	59	45	40	35	40	95	370	862	142	65	92	77
26	48	50	40	35	40	100	402	843	145	63	85	71
27	48	50	40	40	40	100	491	985	139	46	86	67
28	51	50	40	40	40	110	569	1220	127	50	76	64
29	42	50	40	40	---	115	578	1370	123	68	81	61
30	51	50	45	40	---	115	451	1260	113	82	111	59
31	54	---	45	40	---	120	---	1020	---	101	126	---
TOTAL	1654	1416	1330	1225	1175	2125	10303	25103	13835	2481	3265	2402
MEAN	53.4	47.2	42.9	39.5	42	68.5	343	810	461	80	105	80.1
AC-FT	3280	2810	2640	2430	2330	4210	20440	49790	27440	4920	6480	4760
MAX	73	53	50	45	50	120	660	1370	1000	134	186	150
MIN	42	35	40	35	35	40	82	338	113	46	72	58

CAL YR	2009	TOTAL	81779	MEAN	224	MAX	1820	MIN	35	AC-FT	162200
WTR YR	2010	TOTAL	66314	MEAN	182	MAX	1370	MIN	35	AC-FT	131500

MAX DISCH: 1510 CFS AT 22:00 ON May. 29,2010 GH 5.17 FT. SHIFT -0.01 FT. (GH CORR -0.02 FT. APPLIED)
 MAX GH: 5.17 FT. AT 22:00 ON May. 29,2010 (GH CORR -0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220000 RIO GRANDE RIVER NEAR DEL NORTE
Water Year 2010

Location.-- Lat. 37°41'22", Long. 106°27'38", UTM X 371172.2, Y 4172363.8, in NW $\frac{1}{4}$ Sec. 29, T.40 N., R.5 E., Rio Grande County, Hydrologic Unit 13010001, on right bank 40 ft. downstream from county highway (Twin Mountain) bridge, 5 miles upstream from Pinos Creek, and 6 miles west of Del Norte, CO

Drainage and Period of Record.-- 1,320 mi². Measurements and staff gages with frequent readings begun in June of 1889. Various sites used until present site established in Nov. 1910, with a recorder installed in 1934. All missing periods have been estimated and discharge records are complete from July 1, 1889.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, water temperature sensor, and tipping bucket rain gauge in a 6 ft. by 6 ft. exposed aggregate building with a 4 ft. diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 1500 feet above gaging station. Outside staff gage installed during WY2010, but is impossible to read with accuracy.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the period November 27, 2009 through Mar. 24, 2010 when the stage-discharge relation was affected by ice. No instrumentation corrections were made to the shaft encoder during the year.

Datum Corrections.-- Levels were not run this WY. Levels were last run Jul. 22, 2008 to the Reference Point (RP) inside the gage using BM #6 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Low water control is a wide cobble bar 250 feet below the gage. High water control is the river channel. The channel splits at control section. At gage-heights below approximately 1.00 foot, all water flows in left channel. Rating No. 4, in use since March 15, 2007, was used again this year. It is well defined from 53 to 9000 cfs. This rating was extended to 12,500 cfs using data acquired from a USGS cooperative rating curve extension project completed in 2003. Twenty-seven measurements (Nos. 137-163) were made this year, ranging in discharge from 137 to 3960 cfs. They cover the discharge range experienced except for the lower daily flows on Jan. 8-14, 26, 27, 31, Feb. 1, 2, 2010 and higher daily flows on May 22-23 and May 28-31, 2010. The peak flow of 5430 cfs occurred at 0800 on May 29, 2010 at a gage height of 4.53 feet with a shift of 0.0 feet. It exceeded high measurement No. 154 (GH = 3.87), made May 24, 2010 by 0.66 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Open water measurements show shifts varied between -0.03 and +0.02 ft. All measurements were given full weight except Nos. 139, 150, 153, 154, 156-158, 161, and 163, which were adjusted as much as 3 percent to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was based on eight measurements, partial day records, weather records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of ice affected record, which should be considered poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea C. Fleming .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220000 RIO GRANDE RIVER NEAR DEL NORTE

RATING TABLE--

RIODELCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	249	295	170	155	135	150	630	1310	3850	601	593	573
2	234	283	160	160	130	150	520	1160	3590	573	600	502
3	228	279	155	155	140	150	434	1030	3220	637	690	448
4	227	281	145	150	150	160	320	1130	3110	591	685	409
5	247	286	145	150	155	170	359	1590	3450	566	698	368
6	266	277	155	150	155	170	386	2480	3940	524	766	341
7	290	275	165	140	160	170	341	2410	3890	475	723	325
8	326	245	160	130	155	180	481	2510	3620	466	687	377
9	302	232	150	120	150	180	578	2620	3250	468	685	638
10	285	226	140	125	140	180	743	3160	3030	464	620	595
11	276	221	140	130	150	180	925	2970	2770	504	552	524
12	274	222	150	130	150	190	1150	2910	2440	503	532	464
13	284	227	160	130	160	200	1220	2520	2210	460	554	425
14	301	228	165	135	160	200	1050	2040	1670	423	534	405
15	303	228	155	140	150	200	1150	1890	1310	404	487	359
16	310	181	150	150	150	210	1420	1960	1540	372	425	344
17	295	154	150	160	150	220	1780	2530	1760	348	433	336
18	291	189	150	160	150	230	1850	3410	1630	336	395	317
19	292	205	150	160	160	250	1870	3150	1470	323	418	301
20	301	195	150	160	170	260	1820	2670	1370	306	442	297
21	344	192	155	150	170	310	2170	3090	1280	325	402	307
22	347	203	160	150	160	330	2670	4060	1010	382	368	325
23	334	190	165	150	150	370	2410	4240	888	414	393	557
24	321	150	160	150	140	400	1660	3870	830	428	440	539
25	307	148	150	140	145	420	1350	2970	787	382	425	484
26	282	175	150	130	150	469	1280	2540	821	379	386	427
27	266	185	145	135	150	471	1450	2970	843	358	412	375
28	284	180	140	145	150	446	1740	4110	764	333	395	365
29	260	185	145	145	---	480	1980	5000	684	350	386	361
30	231	180	155	140	---	531	1570	4740	640	412	418	346
31	285	---	155	135	---	613	---	4110	---	506	701	---
TOTAL	8842	6517	4745	4460	4235	8640	37307	87150	61667	13613	16245	12434
MEAN	285	217	153	144	151	279	1244	2811	2056	439	524	414
AC-FT	17540	12930	9410	8850	8400	17140	74000	172900	122300	27000	32220	24660
MAX	347	295	170	160	170	613	2670	5000	3940	637	766	638
MIN	227	148	140	120	130	150	320	1030	640	306	368	297

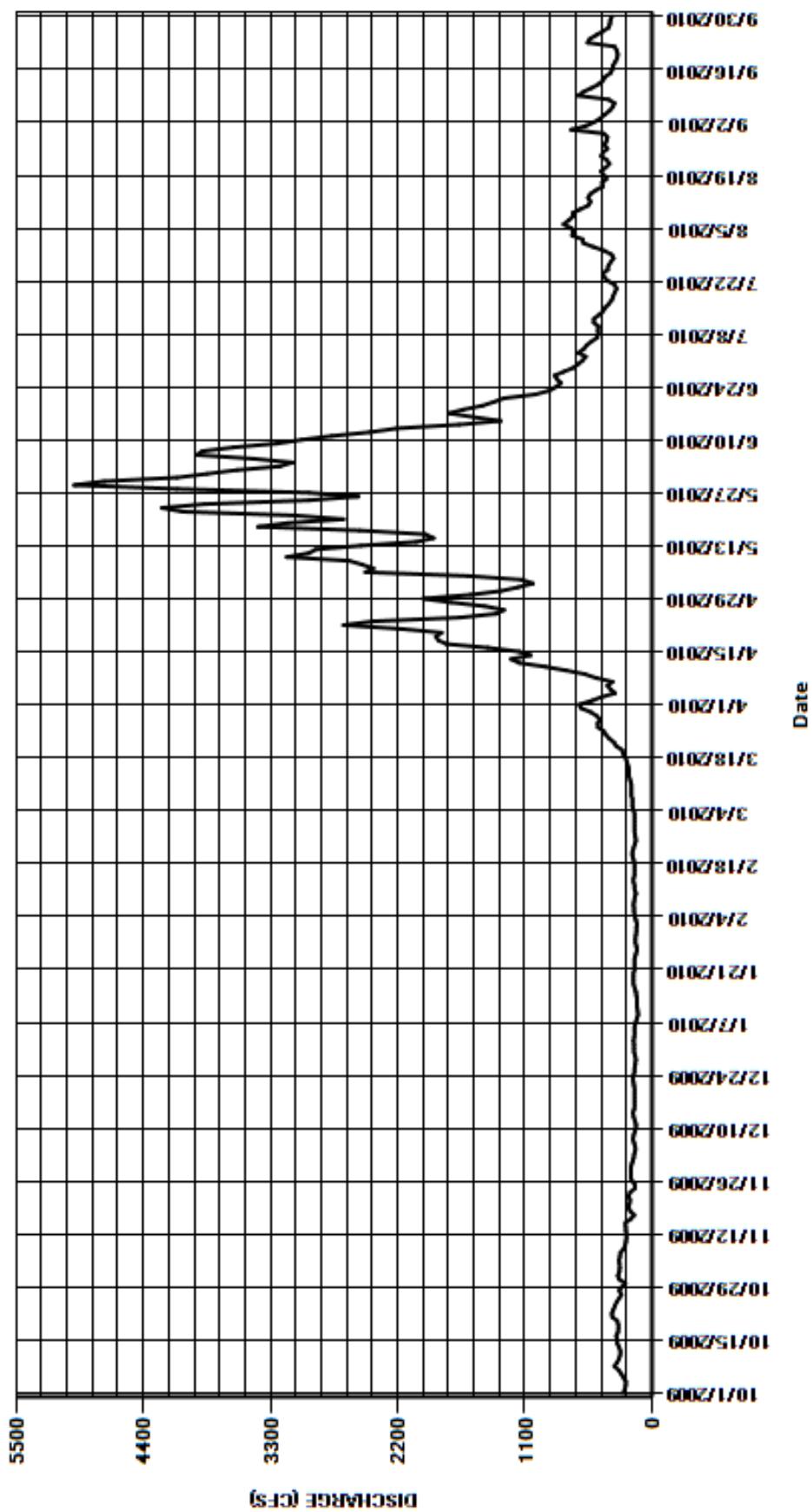
CAL YR	2009	TOTAL	299004	MEAN	819	MAX	5530	MIN	140	AC-FT	593100
WTR YR	2010	TOTAL	265855	MEAN	728	MAX	5000	MIN	120	AC-FT	527300

MAX DISCH: 5430 CFS AT 08:00 ON May. 29,2010 GH 4.53 FT. SHIFT 0 FT.

MAX GH: 4.53 FT. AT 08:00 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220000 RIO GRANDE RIVER NEAR DEL NORTE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220500 PINOS CREEK NEAR DEL NORTE
Water Year 2010

Location.-- Lat. 37 degrees 35 minutes 30 seconds, Long. 106 degrees 26 minutes 51 seconds, UTM X 371984.3, Y 4161499.8, in the SW 1/4 SE 1/4 sec. 29 T. 39, R5E, N.M.P.M. in Rio Grande County, on left bank approximately 200 ft. downstream from Bennett Creek and 8 miles southwest of Del Norte.

Drainage and Period of Record.-- 53 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 3 ft. by 3 ft. timber shelter and concrete well at a 12-foot rectangular concrete box control with a steel triangular ramp on each side of the concrete box at the discharge end. The primary reference gage is a drop tape from reference point on shelf. A supplemental outside staff gage is located in the concrete box. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 25, 2009 to Mar. 31, 2010 when the station was closed for the winter. Stage-discharge relation was affected by ice Nov. 16-24, 2009. There were two shaft encoder corrections of -0.01 and +0.01 feet. These were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on August 6, 2010 using B.M. No. 3 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 13, August 26, 2010. No adjustments were made.

Rating.-- The control is a 12 ft. wide, 12 ft. long, 5 ft. high concrete box/flume with a steel triangular ramp on each side of the concrete box at the discharge end. Minor shifting occurs mainly due to spalling of the concrete and movement of streambed materials through the box. Rocks, trees, and approach angle in the streambed above the gage also cause some shifting. Rating No. 15 was used for the entire water year. Seventeen measurements (Nos. 138-154) were made this year ranging in discharge from 5.41 to 138 cfs. They cover the discharge range experienced except for the lower daily flows on Nov. 24-26, Dec. 7-11, 2009, and higher daily flows on May 22-24, 27-30, 2010. The peak flow of 180 cfs occurred at 2345 on May 27, 2010 at a gage height of 2.30 feet with a shift of 0.00 feet. It exceeded high measurement No. 148 (GH=2.08 ft.), made May 24, 2010 by 0.22 feet in stage.

Discharge.-- The rating was applied with no shift during all open water periods. Open water measurements show shifts ranged from -0.02 to +0.03 feet. Measurement Nos. 147-151, and 153 were adjusted by as much as 5%, and Nos. 138, 145, and 152, which were rated fair and were adjusted by as much as 7% in order to directly apply the rating.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using measurements and comparison with air temperature records from RIOSFKCO.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220500 PINOS CREEK NEAR DEL NORTE

RATING TABLE--

PINDELCO15 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	10	7	7	6	6	12	43	122	20	29	8.4
2	8.7	9.8	6	7	6	7	10	38	110	22	25	7.9
3	8.9	9.6	6	7	7	7	8.1	35	104	26	33	8.3
4	8.9	9.4	6	8	7	7	7.7	43	105	21	21	8
5	9.2	9.3	6	8	7	7	11	64	109	20	21	7.6
6	8.8	9.5	6	8	7	6	11	83	107	19	18	7.2
7	12	9.9	5	7	7	7	11	95	101	20	17	6.6
8	13	9.1	5	7	6	8	13	102	94	23	16	10
9	10	8.4	5	6	6	8	19	121	85	29	16	12
10	9.7	8	5	6	6	7	23	125	78	21	15	8.6
11	9.9	8.1	5	7	6	7	28	117	71	21	14	8.1
12	9.6	8.4	6	7	7	6	32	104	65	19	15	7.4
13	11	8.4	6	7	7	6	36	91	59	15	15	7.1
14	11	8.2	6	7	7	7	33	81	57	14	12	6.9
15	11	8	6	8	8	7	38	86	52	13	11	6.5
16	10	8	6	8	8	7	45	98	49	12	11	6.4
17	9.1	8	7	8	7	8	55	116	47	12	12	6.1
18	9	7	7	8	7	8	55	127	44	13	10	5.7
19	9.2	6	7	8	7	9	47	114	40	13	10	5.7
20	9	7	8	8	8	8	46	107	38	12	11	5.7
21	9.1	7	8	8	8	7	58	134	35	13	9.9	5.8
22	10	7	8	7	7	8	68	144	31	12	9.5	7.5
23	10	6	8	7	6	9	55	144	29	14	11	12
24	10	5	8	7	6	9	44	144	27	12	13	7.6
25	10	5	7	6	5	8	40	123	27	11	12	6.8
26	7.4	5	7	6	5	8	45	128	30	10	9.7	6.5
27	10	6	7	7	6	9	56	139	26	9.8	9.1	6.3
28	9.3	6	6	7	6	10	66	155	23	11	9	6.1
29	7.1	7	6	7	---	11	66	148	22	14	10	5.9
30	11	7	6	7	---	12	50	143	21	14	11	5.9
31	11	---	7	6	---	12	---	131	---	26	10	---
TOTAL	302.9	231.1	199.0	222.0	186.0	246.0	1088.8	3323	1808	511.8	446.2	220.6
MEAN	9.77	7.7	6.42	7.16	6.64	7.94	36.3	107	60.3	16.5	14.4	7.35
AC-FT	601	458	395	440	369	488	2160	6590	3590	1020	885	438
MAX	13	10	8	8	8	12	68	155	122	29	33	12
MIN	7.1	5	5	6	5	6	7.7	35	21	9.8	9	5.7

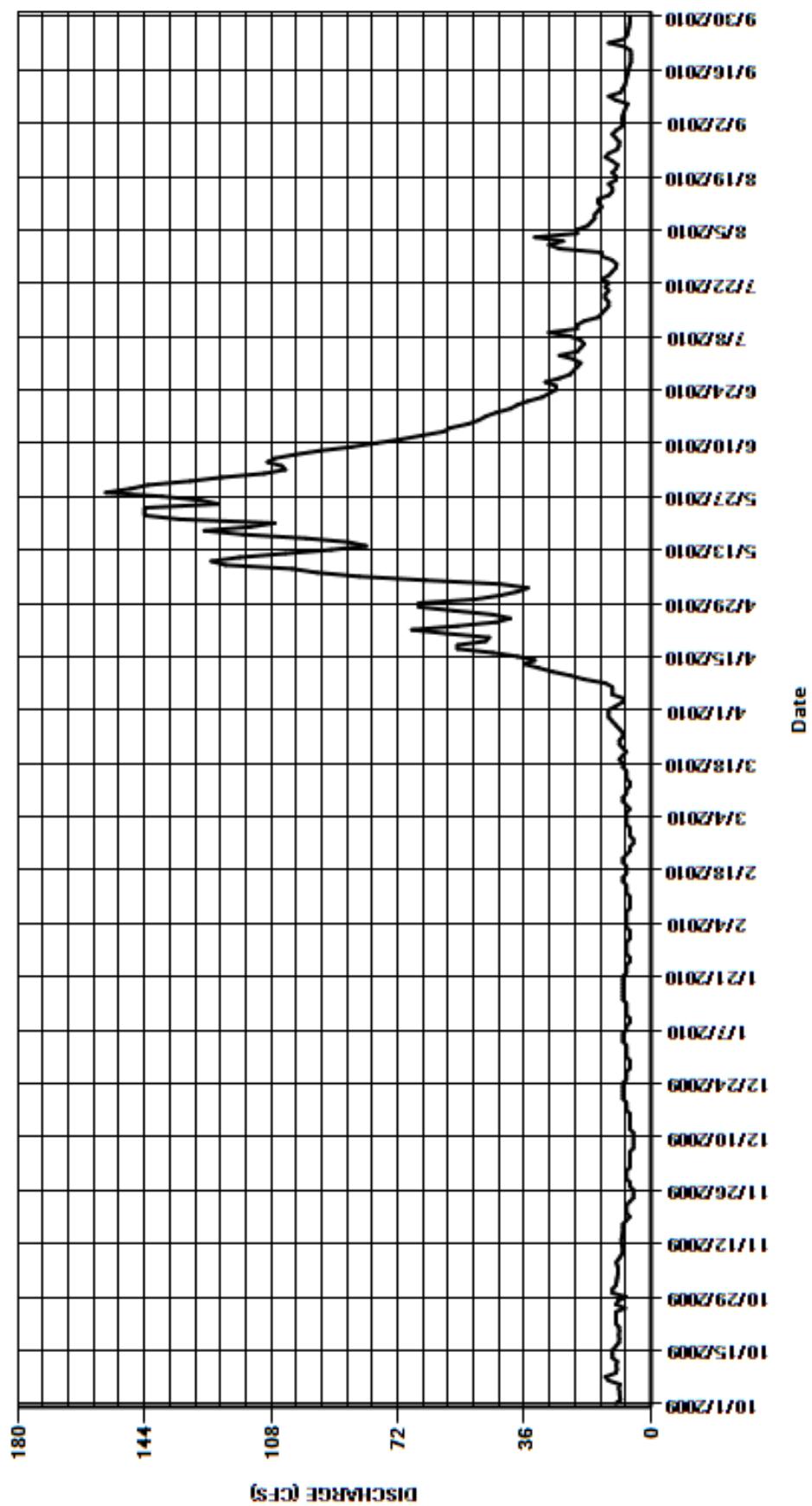
CAL YR	2009	TOTAL	11409.8	MEAN	31.3	MAX	220	MIN	5	AC-FT	22630
WTR YR	2010	TOTAL	8785.4	MEAN	24.1	MAX	155	MIN	5	AC-FT	17430

MAX DISCH: 180 CFS AT 23:45 ON May. 27,2010 GH 2.3 FT. SHIFT 0 FT.

MAX GH: 2.3 FT. AT 23:45 ON May. 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220500 PINOS CREEK NEAR DEL NORTE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08221500 RIO GRANDE RIVER AT MONTE VISTA
Water Year 2010

Location.-- Lat. 37°36'34", Long. 106°08'54", UTM X 398593.7, Y 4163104.3, in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, T.39 N., R.8 E., Rio Grande County, Hydrographic Unit 13010002, on left bank 40 ft. downstream from bridge on U.S. Highway 285, 2.0 mi. north of Monte Vista, and 12 mi. downstream from San Francisco Creek.

Drainage and Period of Record.-- 1,590 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping-bucket rain gauge in a 72 inch corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the stage-discharge relation was affected by ice Nov. 24, 2009 through Mar. 27, 2010. There was a +0.01 ft shaft encoder correction on Jul. 6, 2010, which was prorated from previous visit. A -0.01 ft flush correction was noted on Aug. 18, 2010, but was not applied since the small drop in gage-height during the flush appeared natural.

Datum Corrections.-- Levels were not run this year. Levels were last run Jul. 22, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control at most stages is small cobble riffle approximately 500 ft. below gage. Low water control is a gravel and small cobble riffle 25 feet below the gage. There are two channels at gage during lower stages due to sedimentation behind bridge pier above gage. Rating No. 21-1, in use since Oct. 1, 2008, was used again this year. It is well defined from 16 to 5500 cfs. Thirteen measurements (Nos. 253-265) were made this year, ranging in discharge from 57.1 to 1,200 cfs. They cover the discharge range experienced except for the lower daily flows on Oct. 30, Nov. 17, 18, 22, 26, 2009 and the higher daily flows on May 22, 23, 27-31, Jun. 1-3, 5-9, 2010. The peak flow of 2200 cfs occurred at 0930 on May 28, 2010 at a gage height of 5.67 ft. with a shift of +0.01 feet. It exceeded high measurement No. 258 (GH = 4.62), made May 6, 2010, by 1.05 feet in stage.

Discharge.-- Shifting-control method was used for all open water periods. Shifts were applied as defined by measurements and distributed by time. The measurements show shifts ranged from -0.02 to +0.08 ft. All measurements were given full weight except Nos. 253, 254, 257, 258, 260, 262, 263, and 265, which were adjusted as much as 5% to smooth shift distribution. The high measurement, No. 258, was adjusted by 5% toward the rating since it was rated fair to poor due to the gage-height dropping 0.25 ft during measurement.

Special Computations.-- Discharge for periods of ice affected record was based on comparison with nearby gages using a river accounting sheet.

Remarks.-- Record is good except for periods of ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08221500 RIO GRANDE RIVER AT MONTE VISTA

RATING TABLE--

RIOMONCO21-1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

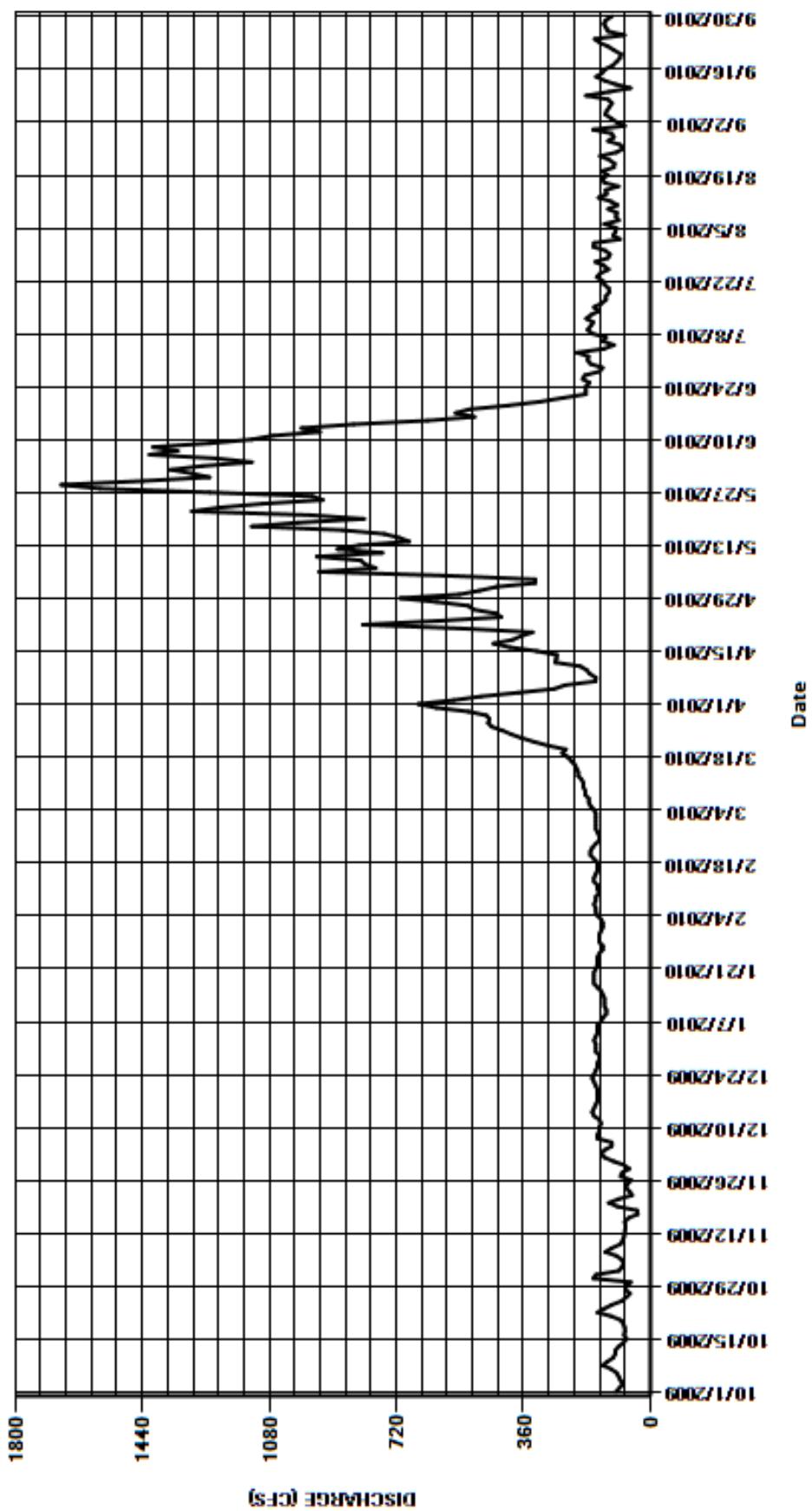
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	154	105	155	135	155	658	485	1300	178	160	73
2	88	90	130	160	135	155	558	437	1360	176	86	96
3	78	81	140	155	140	155	480	327	1270	208	106	112
4	85	76	130	150	150	160	373	326	1130	132	99	128
5	90	82	110	150	155	170	273	584	1230	103	97	124
6	96	97	110	150	155	175	242	939	1420	135	131	116
7	111	128	150	140	160	175	156	779	1340	126	90	109
8	135	110	150	135	155	185	155	810	1410	164	98	120
9	122	86	145	125	155	185	172	821	1250	178	95	182
10	106	79	145	125	145	190	181	946	1130	170	120	117
11	100	75	140	130	150	190	199	760	1070	162	93	57
12	99	73	145	130	150	195	270	887	937	182	112	99
13	90	72	160	130	160	205	267	825	989	168	147	131
14	76	71	165	135	160	205	265	684	842	147	124	154
15	68	73	160	140	155	210	322	712	632	160	127	137
16	75	62	155	150	150	215	398	754	499	139	91	128
17	72	36	150	160	150	225	445	871	552	126	131	107
18	73	38	150	160	150	235	391	1130	513	126	136	96
19	77	93	150	160	160	250	366	1000	404	117	121	86
20	85	118	150	160	170	240	334	812	313	118	138	84
21	111	90	155	155	170	290	534	964	249	131	104	103
22	150	52	160	150	165	330	815	1300	183	136	102	120
23	131	59	165	150	155	365	603	1220	183	152	117	144
24	110	70	160	150	145	395	423	1100	183	142	143	158
25	82	65	155	145	145	420	440	929	173	119	96	74
26	69	55	150	135	150	450	502	959	192	132	77	120
27	58	85	150	135	155	460	516	1250	186	156	86	126
28	71	80	145	145	155	456	605	1560	144	121	120	132
29	68	60	145	145	---	465	709	1670	136	115	104	126
30	56	75	155	145	---	516	542	1440	170	128	110	109
31	162	---	155	140	---	606	---	1250	---	162	163	---
TOTAL	2892	2385	4535	4495	4280	8628	12194	28531	21390	4509	3524	3468
MEAN	93.3	79.5	146	145	153	278	406	920	713	145	114	116
AC-FT	5740	4730	9000	8920	8490	17110	24190	56590	42430	8940	6990	6880
MAX	162	154	165	160	170	606	815	1670	1420	208	163	182
MIN	56	36	105	125	135	155	155	326	136	103	77	57
CAL YR	2009	TOTAL	114210	MEAN	313	MAX	2210	MIN	36	AC-FT	226500	
WTR YR	2010	TOTAL	100831	MEAN	276	MAX	1670	MIN	36	AC-FT	200000	

MAX DISCH: 2200 CFS AT 09:30 ON May. 28,2010 GH 5.67 FT. SHIFT 0.01 FT.

MAX GH: 5.67 FT. AT 09:30 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08221500 RIO GRANDE RIVER AT MONTE VISTA
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
Water Year 2010

Location.--	UTM X 406626, Y 4158964, in NW ¼ NW ¼ NW ¼ section 1, T38N, R8E, NMPM, Rio Grande County, on left bank approximately 1 mile above bridge on county line road.
Drainage and Period of Record.--	1,640 mi ² .
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 42-inch diameter corrugated metal well and shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Jan. 3 through Mar. 9, 2010 when ice in the oil cylinder was affecting float; and Nov. 24, 2009 through Jan. 2, 2010 and Mar. 10–17, 2010, when the stage-discharge relation was affected by ice. There were two shaft encoder corrections. A +0.12 ft correction was made on Mar. 12, 2010 and was distributed straight back to when ice in oil cylinder stopped affecting float. A -0.02 ft correction was made on May 6, 2010 and was prorated by time from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Oct. 26, 2009 using B.M. No. 4 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.
Rating.--	Rating RIOLINCO09 was used again this year. Thirteen measurements (Nos. 340-352) were made this year ranging in discharge from 33.6 to 507 cfs. These measurements cover the discharge range experienced except for lower daily flows on Nov. 9-18, 22-24, 2009, Apr. 14, 20, Sep. 11, 12, 2010 and higher daily flows on Mar. 30, 31, Apr. 1, 2, May 27-29, Jun. 3, 9, 2010. The maximum discharge of 912 cfs occurred at 1215 on May 28, 2010 at a gage height of 5.07 ft. with a shift of 0 ft. It exceeded high measurement No. 345 (GH = 4.19) by 0.88 feet in stage.
Discharge.--	Shifting control method was used during all open water periods. A variable shift curve was used from Oct. 1, 2009 to May 6, 2010 to distribute shifts according to stage. Last year's low measurement No. 328 was used to define the extreme low end of this shift curve. During other periods, shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.06 to 0.00 ft. All open water measurements were given full weight except for Nos. 343, 347, and 351, which were adjusted by as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated by comparison with nearby stations using a river accounting sheet.
Remarks.--	Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman .
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE

RATING TABLE--

RIOLINCO09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

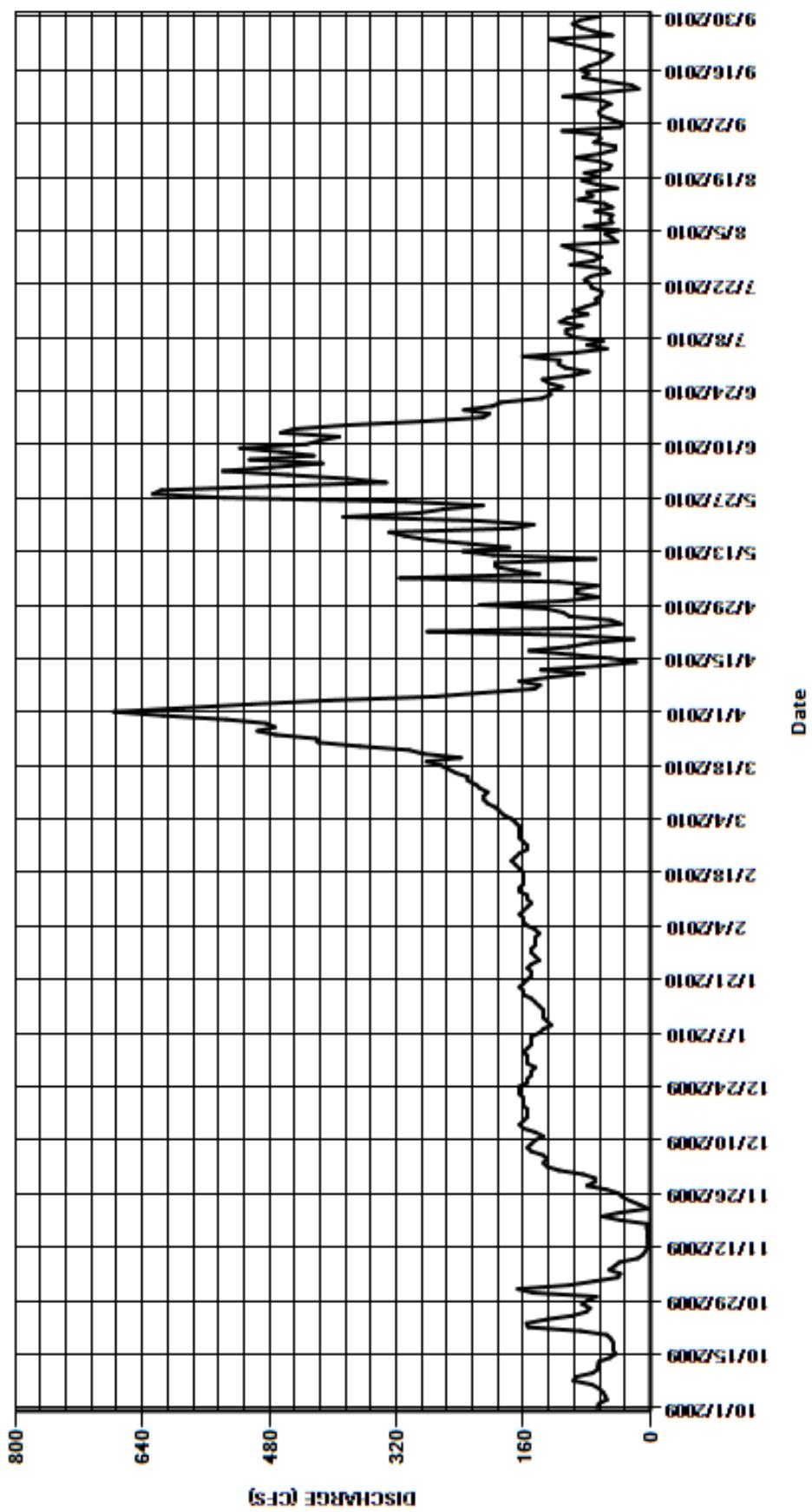
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	167	85	155	145	165	676	65	382	116	111	38
2	65	102	115	160	140	165	589	93	457	114	42	34
3	55	71	130	155	145	170	502	94	539	161	48	49
4	57	41	135	150	155	175	404	67	476	94	57	63
5	60	38	130	150	160	185	271	116	413	55	40	65
6	65	52	135	150	160	190	212	316	505	80	83	60
7	74	45	150	140	165	195	146	140	424	60	48	50
8	97	39	155	135	160	205	139	172	465	96	51	62
9	94	16	150	125	155	210	165	195	517	106	48	110
10	73	9.4	145	130	150	210	129	196	434	106	70	61
11	66	6.2	135	135	155	205	84	69	416	86	48	15
12	66	2.8	145	135	155	215	138	198	392	114	58	24
13	65	3.7	160	135	165	220	65	236	466	105	91	58
14	51	3.5	165	140	165	230	18	178	449	79	73	85
15	44	3.9	160	145	160	230	50	229	383	97	80	78
16	47	3.3	155	150	160	245	100	280	288	82	42	88
17	47	5	155	160	160	255	153	309	211	67	68	77
18	47	2.7	155	160	160	264	103	329	203	69	86	62
19	50	38	160	165	165	282	75	173	235	62	65	54
20	55	61	160	160	170	239	21	147	199	61	83	48
21	88	38	160	155	175	286	96	218	188	74	53	65
22	154	2.6	165	150	170	304	281	387	137	76	50	84
23	156	13	165	150	165	366	79	293	126	83	64	107
24	132	25	165	155	155	419	37	261	127	75	95	126
25	98	35	155	150	155	421	50	211	111	52	64	48
26	81	40	155	140	160	472	102	308	128	58	45	71
27	76	55	150	145	165	495	110	537	136	101	44	87
28	86	80	150	150	165	473	131	627	98	72	71	98
29	79	70	145	150	---	484	215	616	78	62	63	88
30	68	70	155	145	---	534	109	482	107	74	65	63
31	148	---	155	145	---	614	---	333	---	97	111	---
TOTAL	2411	1139.1	4600	4570	4460	9123	5250	7875	9090	2634	2017	2018
MEAN	77.8	38	148	147	159	294	175	254	303	85	65.1	67.3
AC-FT	4780	2260	9120	9060	8850	18100	10410	15620	18030	5220	4000	4000
MAX	156	167	165	165	175	614	676	627	539	161	111	126
MIN	44	2.6	85	125	140	165	18	65	78	52	40	15
CAL YR	2009	TOTAL	58369.4	MEAN	160	MAX	903	MIN	2.6	AC-FT	115800	
WTR YR	2010	TOTAL	55187.1	MEAN	151	MAX	676	MIN	2.6	AC-FT	109500	

MAX DISCH: 912 CFS AT 12:15 ON May. 28,2010 GH 5.07 FT. SHIFT 0 FT.

MAX GH: 5.07 FT. AT 12:15 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08223000 RIO GRANDE RIVER AT ALAMOSA
Water Year 2010

Location.-- Lat. 37°28'51", Long. 105°52'39", UTM X 422194.7, Y 4148640.6, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 4, T. 37 N., R. 10 E., Alamosa County, on left bank 0.3 mile northwest of Adams State College and 9 miles upstream from Alamosa Creek.

Drainage and Period of Record.-- 1,710 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), air temperature sensor, and a float-operated shaft encoder in a 4 ft. by 6 ft. exposed aggregate building with a 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the stage-discharge relation was affected by ice Nov. 24, 2009 through Mar. 19, 2010. There was a +0.01 ft shaft encoder correction on Jul. 6, 2010, and a +0.01 ft correction due to cleaning trash from inlets on Aug. 18, 2010. Both were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul. 13, 2010 using B.M. No. 7 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a sand streambed and channel. The sand movement, change in vegetation, and changes to downstream diversion structure (Westside Diversion) cause numerous shift changes. Rating No. 22D was used this water year. The upper end of curve (above 1500 cfs) was created by the USGS using indirect measurement methods as part of a cooperative rating curve extension project. Fifteen measurements (Nos. 316-330) were made this year ranging in discharge from 29.6 to 419 cfs. They cover the discharge range experienced except for lower daily flows on Jul. 22, 23, 27-31, Aug. 3-10, 12, 13, 23, 28, 2010 and higher daily flows on Mar. 26-31, Apr. 1-4, 2010. The peak flow of 686 cfs occurred at 0130 on Apr. 2, 2010 at a gage height of 4.82 ft. with a shift of -0.38 ft. It exceeded high measurement No. 319 (GH=3.86), made Mar. 24, 2010 by 0.96 ft. in stage.

Discharge.-- Shifting control method was used for all open water periods. Shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied from -0.52 to -0.27 ft. All measurements were given full weight and applied except Nos. 316, 318, 320, 322, 323, and 325, which were adjusted by as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated by comparison with nearby stations using a river accounting sheet.

Remarks.-- Record is good except for periods of ice-affected record, which are poor; and periods of daily discharge greater than 500 cfs, including the peak discharge, should be considered fair. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08223000 RIO GRANDE RIVER AT ALAMOSA

RATING TABLE--

RIOALACO22D USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

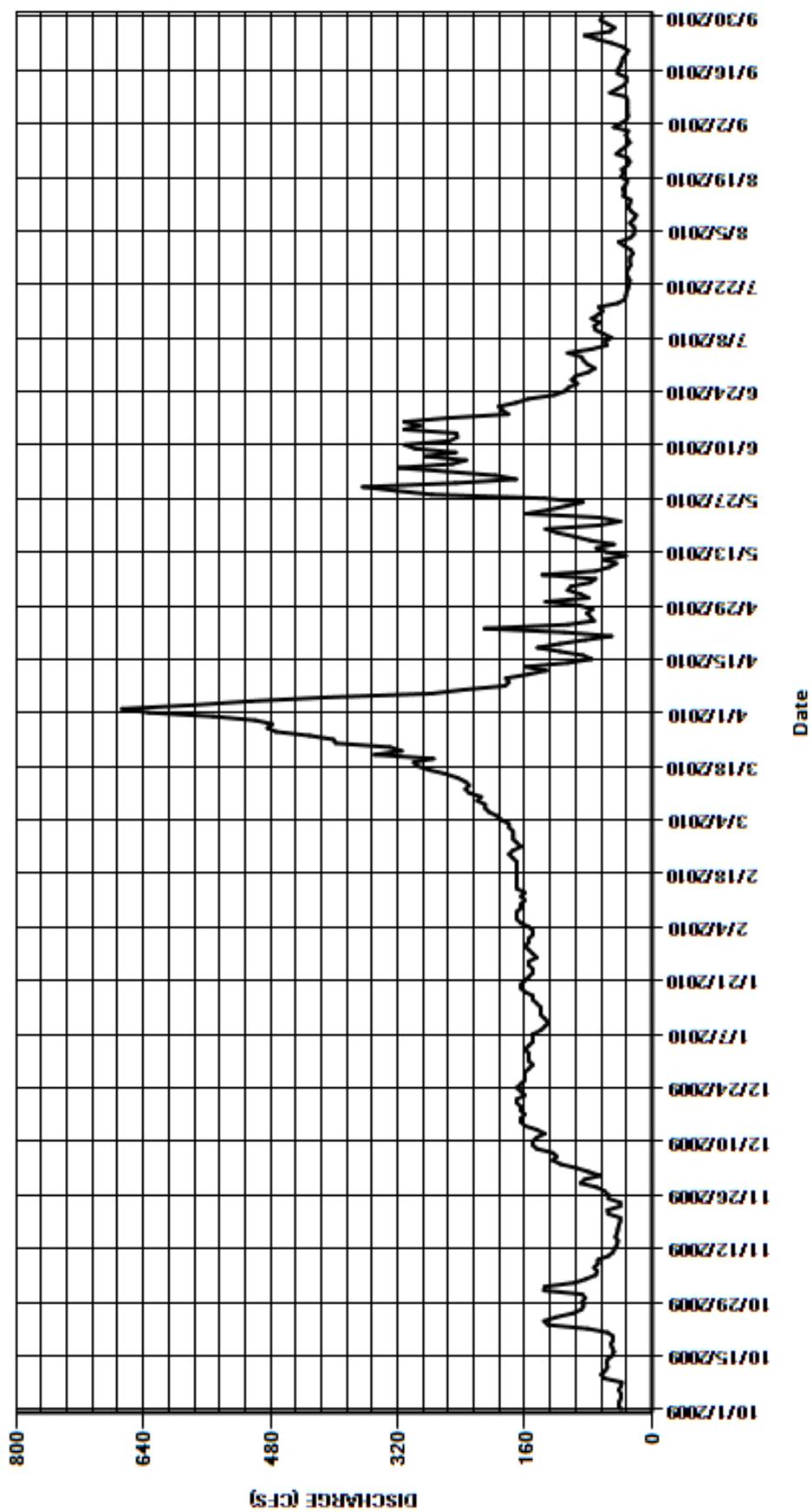
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	136	65	155	155	175	633	80	171	81	35	48
2	42	135	80	155	150	180	667	90	197	86	42	39
3	41	97	95	160	150	180	576	106	258	89	28	32
4	39	83	115	155	155	190	504	102	319	106	23	30
5	39	71	125	150	165	195	410	78	251	76	22	31
6	42	69	120	150	170	205	277	71	234	57	23	31
7	39	73	125	150	170	210	236	138	285	59	28	31
8	38	68	145	140	170	210	185	71	247	51	23	31
9	60	68	150	135	165	220	180	54	298	61	20	33
10	64	55	150	130	165	215	184	45	311	71	26	53
11	59	49	145	135	160	230	156	61	255	73	30	44
12	56	47	135	140	165	235	133	33	245	66	28	35
13	57	44	145	140	160	230	159	58	246	76	27	32
14	56	43	160	140	170	235	106	70	312	68	36	32
15	50	46	165	145	170	245	76	48	292	62	35	43
16	48	44	165	150	170	260	87	78	312	67	37	43
17	50	43	160	150	170	280	116	97	257	43	33	40
18	52	42	165	160	170	295	144	119	181	34	31	38
19	49	40	165	165	170	300	116	134	188	33	39	37
20	49	40	170	165	170	275	84	65	193	32	36	33
21	56	55	170	160	170	349	51	40	171	30	38	30
22	81	56	160	155	175	315	110	66	156	29	31	37
23	131	40	165	150	180	330	211	158	123	28	28	51
24	136	40	170	150	175	398	106	130	110	31	31	69
25	121	55	165	155	165	401	73	108	105	32	45	85
26	100	55	160	155	170	431	77	87	94	30	39	53
27	89	60	160	145	175	473	82	135	101	27	33	47
28	86	70	160	150	175	484	75	277	96	28	28	56
29	88	90	155	155	---	478	91	322	80	28	31	65
30	84	85	150	160	---	499	134	364	72	24	33	62
31	88	---	155	155	---	552	---	247	---	27	30	---
TOTAL	2029	1899	4515	4660	4675	9275	6039	3532	6160	1605	969	1291
MEAN	65.5	63.3	146	150	167	299	201	114	205	51.8	31.3	43
AC-FT	4020	3770	8960	9240	9270	18400	11980	7010	12220	3180	1920	2560
MAX	136	136	170	165	180	552	667	364	319	106	45	85
MIN	38	40	65	130	150	175	51	33	72	24	20	30
CAL YR	2009	TOTAL	53137	MEAN	146	MAX	761	MIN	24	AC-FT	105400	
WTR YR	2010	TOTAL	46649	MEAN	128	MAX	667	MIN	20	AC-FT	92530	

MAX DISCH: 686 CFS AT 01:30 ON Apr. 02,2010 GH 4.82 FT. SHIFT -0.38 FT.

MAX GH: 4.82 FT. AT 01:30 ON Apr. 02,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**08223000 RIO GRANDE RIVER AT ALAMOSA
WY2010 HYDROGRAPH**



RIO GRANDE RIVER BASIN
372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
Water Year 2010

Location.-- Lat. 37°28'33", Long. 105°45'58", UTM X 432260.8, Y 4147935.8, SW $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 3, T.37 N., R.11 E., Alamosa County, Hydrologic Unit 13010002, 400 ft north of State Highway 160, 5.5 mi east of Alamosa, Co. on right bank of Closed Basin Project Canal.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and two float-operated shaft encoders on wells Ha and Hb in 8 ft. x 10 ft. steel plated building with concrete stilling wells. The Bureau of Reclamation owns and operates an independent electronic data acquisition system using pressure transducers, a water quality monitor, and temperature sensor. The primary reference gage is a drop tape from reference point on shelf. There is a supplemental outside staff gage in the flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the stage-discharge relation was affected by backwater (submerged) on Nov. 24, 2009, and Feb. 6, 11-15, 2010. There were eight cleaning corrections applied as needed for the moss removal in the flume and prorated from the previous visits. There were no instrument corrections made to the shaft encoder.

Datum Corrections.-- Levels were not run this WY. Levels were last run Aug. 7, 2008 to the Ha well and Hb well Reference Points (RP) inside the gage using R.M. #1 as base. Both RPs were within allowable limits, so no correction was made.

Rating.-- The control structure is a 12 ft. concrete Parshall flume. A standard rating for a 12 ft. Parshall flume has been in use since Sep. 23, 1987. Twenty-six measurements (Nos. 583-608) were made this year, ranging in discharge from 6.73 to 35.8 cfs. They cover the discharge range experienced. The peak flow of 35.4 cfs occurred at 0930 on Oct. 15, 2009 at a gage height of 0.81 feet with a shift of +0.03 feet. It exceeded high measurement No. 584 (GH=0.80 ft.), made Oct. 15, 2009, by 0.01 feet in stage.

Discharge.-- Shifting control method was used for the entire year. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied between -0.04 and +0.05 feet. All measurements were given full weight and applied except Nos. 584, 593, 594, 599, 602, 605, and 608, which were adjusted as much as five percent to smooth shift distribution. Generally, the high measurement is not adjusted, but this year's high, No. 584, was adjusted by 3%. This is due to the fact that it occurred in October and was finalized as a calendar year record in January, 2010, before it was known that it would be the high measurement for the water year.

Special Computations.-- None.

Remarks.-- Record is good except for periods of backwater effect (submergence), which are fair to poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA

RATING TABLE-- CBPALACO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

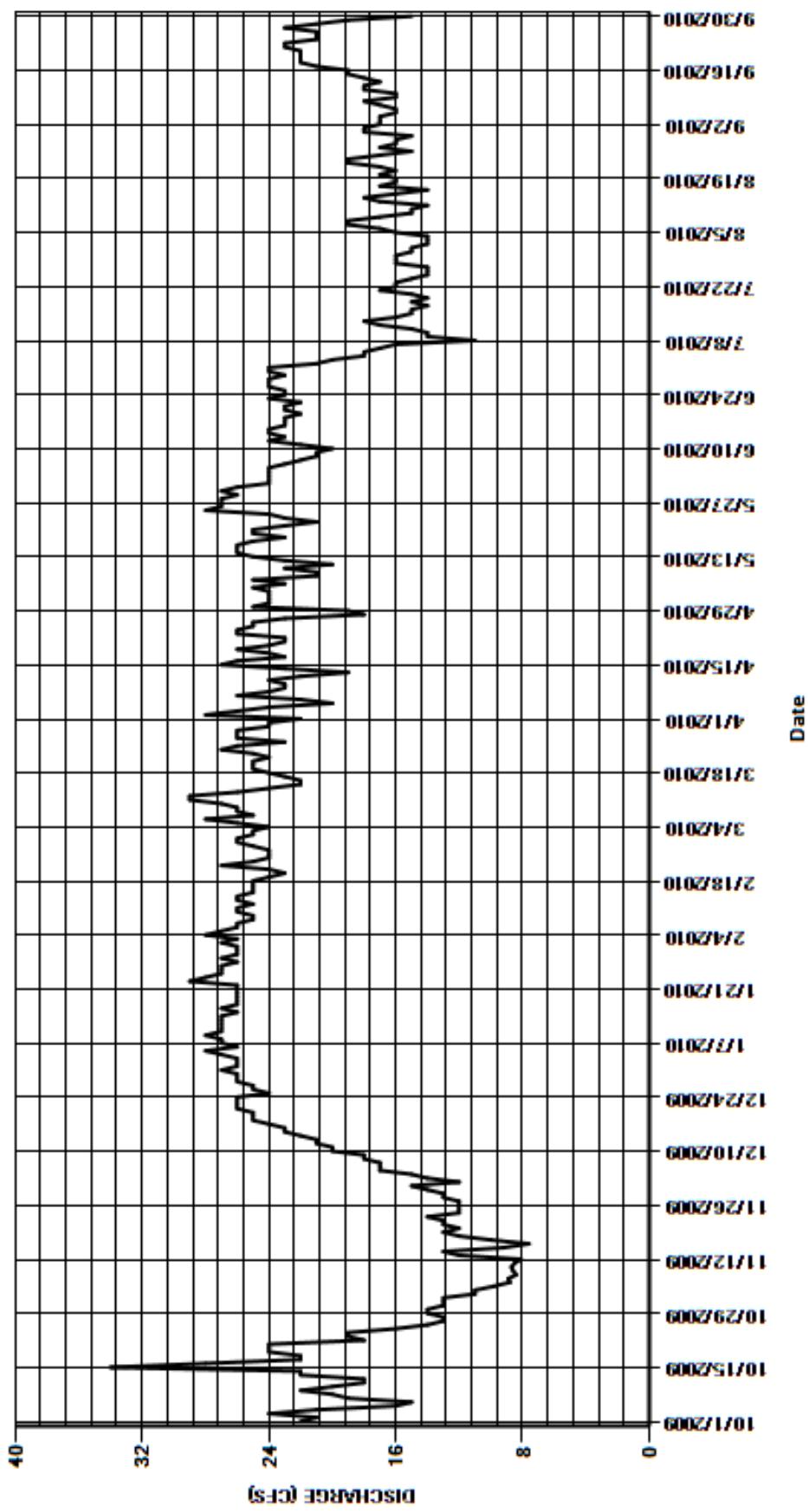
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	13	15	26	26	26	22	24	24	24	15	18
2	21	13	12	26	27	25	28	24	24	21	14	17
3	24	11	14	26	26	25	26	24	24	20	14	17
4	21	11	15	27	28	24	24	24	24	18	14	17
5	16	9.8	17	28	27	26	20	25	24	18	16	16
6	15	8.8	17	26	26	28	22	23	23	17	17	16
7	19	8.9	17	27	26	25	26	25	22	16	19	17
8	20	8.4	18	27	25	26	24	21	21	11	19	18
9	22	8.6	18	28	25	26	23	21	21	14	17	16
10	20	8.7	20	27	26	27	23	23	20	14	15	16
11	18	8.5	20	27	26	29	24	20	22	15	15	18
12	18	8.1	21	27	25	29	22	23	24	17	14	18
13	22	12	21	27	26	26	19	25	23	18	17	17
14	22	13	22	27	26	24	23	26	24	16	18	18
15	34	9.2	23	26	25	22	27	26	24	15	16	19
16	28	7.6	23	27	25	22	26	26	23	15	14	19
17	22	10	24	26	25	23	23	25	23	14	17	21
18	22	12	25	26	25	24	24	23	23	15	16	22
19	24	13	25	26	24	25	26	25	22	14	16	22
20	24	12	25	26	23	25	24	25	23	15	17	22
21	24	13	26	26	24	25	23	23	23	17	16	22
22	18	13	26	26	27	24	23	21	22	16	17	23
23	19	14	26	29	25	25	26	23	24	16	19	23
24	19	12	26	28	24	27	26	24	23	15	19	21
25	16	12	24	27	24	26	25	28	23	14	17	21
26	14	12	25	27	24	23	25	27	24	14	15	21
27	13	12	25	27	25	26	23	27	24	14	17	23
28	13	13	26	26	26	26	18	27	24	16	16	21
29	14	13	26	27	---	26	19	26	23	16	16	19
30	14	14	26	26	---	24	25	27	24	16	15	15
31	13	---	27	26	---	24	---	26	---	15	18	---
TOTAL	611	334.6	675	828	711	783	709	757	692	496	505	573
MEAN	19.7	11.2	21.8	26.7	25.4	25.3	23.6	24.4	23.1	16	16.3	19.1
AC-FT	1210	664	1340	1640	1410	1550	1410	1500	1370	984	1000	1140
MAX	34	14	27	29	28	29	28	28	24	24	19	23
MIN	13	7.6	12	26	23	22	18	20	20	11	14	15
CAL YR	2009	TOTAL	8223.0	MEAN	22.5	MAX	34	MIN	3.6	AC-FT	16310	
WTR YR	2010	TOTAL	7674.6	MEAN	21	MAX	34	MIN	7.6	AC-FT	15220	

MAX DISCH: 35.4 CFS AT 09:30 ON Oct. 15,2009 GH 0.81 FT. SHIFT 0.03 FT.
MAX GH: 0.88 FT. AT 01:45 ON Feb. 14,2010 (Backwater Affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08224500 KERBER CREEK NEAR VILLA GROVE
Water Year 2010

Location.-- Lat. $38^{\circ}13'13''$, Long. $106^{\circ}05'20''$, UTM X 404609.1, Y 4230816.9, in SW $\frac{1}{4}$ SE $\frac{1}{4}$, sec. 21, T. 46 N., R. 8 E., Saguache County, on left bank 7 miles west of Villa Grove and 5 $\frac{1}{2}$ miles downstream from the town of Bonanza.

Drainage and Period of Record.-- 45.4 mi 2 (revised). (approx.) Originally established with staff gage only in 1911. Station at various locations from that time.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 6 ft. by 6 ft. exposed aggregate shelter and 48 inch concrete well. On Nov. 10, 2009 the gage was equipped with a tipping bucket rain gage. The primary reference gage is a drop tape from reference point on shelf. No outside gage.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year, except for Dec. 11, 2009 through Mar. 29, 2010 when ice in the well was affecting the floats. Stage-discharge relation was affected by ice Oct. 27-30, Nov. 2, 13-18, 23-30, Dec. 1-10, 2009, Mar. 30, 31, Apr. 1, 5, 6, 9-15, 2010. There were no instrument corrections made to the shaft encoder.

Datum Corrections.-- Levels were not run at the gage this year. Levels were last run to the Reference Point (RP) inside the gage on July 29, 2009 using B.M. No. 8 as base. The RP elevation was within the allowable limit, therefore, no correction was made.

Rating.-- Control is a concrete ramp flume approximately 10 feet downstream from gage. Shifting occurs mainly due to the movement of streambed materials in the gage pool, especially at high stages. Rating No. 19 was used all year. Sixteen measurements (Nos. 119-134) were made this year ranging in discharge from 0.26 to 51.2 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 24, 28-31, Jun. 1, 2, 5-7, 2010. The peak gage height of 1.67 ft. occurred at 1815 Mar. 30, 2010 while ice affected. The peak flow of 76 cfs occurred at 1700 on Aug. 2, 2009 at a gage height of 1.32 feet with a shift of 0.03 feet. It exceeded high measurement No. 129 (GH = 1.14), made June 9, 2010 by 0.18 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. A shift curve (KERVILSC1001) was used to apply shifts by gage-height for low flow period from Aug. 31 through Sep 30, 2010. The rest of the year shifts were applied as defined by discharge measurements and distributed by time. Measurements for the water year show shifts varied between -0.02 and +0.06 ft. All measurements were given full weight except Nos. 127, 128, 131, and 134, which were adjusted as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six measurements, nearby stations and weather records.

Remarks.-- The record is good except for periods of no gage-height and ice affected record, which should be considered poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08224500 KERBER CREEK NEAR VILLA GROVE

RATING TABLE--

KERVILCO19 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3	3.8	2.3	1.3	1.3	1.7	3.2	18	52	11	14	2.2
2	2.9	3.8	1.8	1.5	1.2	1.8	4.4	17	52	12	22	2.1
3	3.4	3.9	1	1.5	1.3	1.8	3.6	16	49	13	18	2.1
4	3.6	3.7	0.8	1.5	1.5	1.9	5.9	17	47	11	14	2
5	3.5	3.6	0.6	1.6	1.4	1.9	5	18	54	9.7	11	1.9
6	3.5	3.5	0.6	1.7	1.4	2	5	20	58	8.9	9.8	1.8
7	3.6	3.4	0.6	1.6	1.3	2	4.5	19	56	8.8	8.6	1.9
8	3.7	3.3	0.7	1.5	1.3	2.2	5.8	20	50	9.2	8	3.7
9	3.2	3.1	0.5	1.4	1.3	2.1	6.5	22	51	7.9	7.5	3.8
10	3.3	2.9	0.5	1.4	1.2	2.1	7	26	44	7.2	6.8	2.4
11	3.4	3.1	0.5	1.5	1.3	2.2	8	27	39	7	6.1	2.2
12	3	3	0.8	1.5	1.4	2.2	11	28	38	6.8	6.5	2.2
13	3.3	2.9	1.3	1.5	1.5	2.3	13	27	35	6.6	6	2.2
14	3.3	2.8	1.2	1.6	1.5	2.3	15	26	32	6.6	4.9	2.1
15	3.4	2.2	1.2	1.6	1.4	2.2	17	26	28	5.9	4.5	2
16	3.1	2	1.2	1.5	1.4	2.4	17	24	25	5.4	4.6	1.9
17	2.9	2.2	1.4	1.5	1.4	2.5	19	26	24	5.2	5.1	1.8
18	2.7	2.8	1.3	1.4	1.4	2.4	18	30	22	5.1	4.1	1.8
19	2.8	3.2	1.2	1.4	1.5	2.3	18	31	21	4.8	3.8	1.8
20	2.7	3.1	1.2	1.4	1.5	2.3	18	28	19	5.1	3.7	1.8
21	3.3	2.9	1.2	1.4	1.5	2.5	20	30	18	6.6	3.4	1.9
22	3.1	2.7	1.3	1.4	1.4	2.5	23	38	17	5.4	3.2	3
23	3.3	2.5	1.4	1.4	1.3	2.6	20	49	16	4.9	4	4.7
24	3.2	2.2	1.3	1.3	1.4	2.5	17	52	15	4.7	3.9	2.8
25	3.2	2.7	1.2	1.3	1.5	2.5	17	45	15	4.2	3.4	2.3
26	2.5	3.2	1.2	1.2	1.6	2.5	16	42	15	5.3	2.9	2.2
27	2.4	3.4	1.2	1.3	1.6	2.6	17	45	15	4.6	2.8	2.1
28	2.3	3.3	1.1	1.4	1.7	2.8	19	54	14	4.6	2.7	2
29	2	3	1.2	1.3	---	3	21	62	14	6.7	3	2
30	3.2	2.8	1.2	1.3	---	3.5	18	61	12	8.8	2.8	2
31	3.9	---	1.2	1.3	---	3.5	---	53	---	10	2.6	---
TOTAL	96.7	91.0	34.20	44.5	39.5	73.1	392.9	997	947	223.0	203.7	68.7
MEAN	3.12	3.03	1.1	1.44	1.41	2.36	13.1	32.2	31.6	7.19	6.57	2.29
AC-FT	192	180	68	88	78	145	779	1980	1880	442	404	136
MAX	3.9	3.9	2.3	1.7	1.7	3.5	23	62	58	13	22	4.7
MIN	2	2	0.5	1.2	1.2	1.7	3.2	16	12	4.2	2.6	1.8

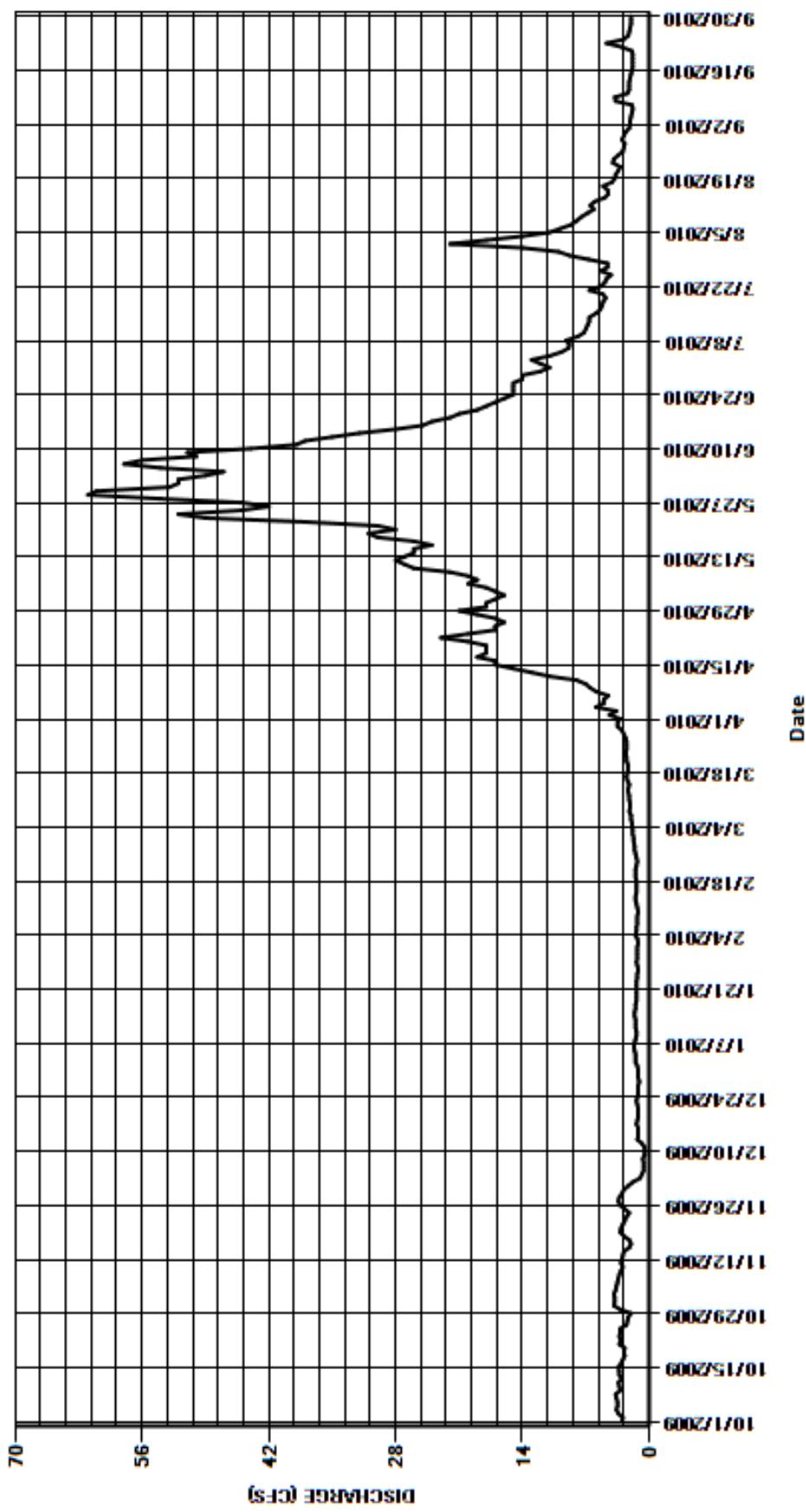
CAL YR	2009	TOTAL	3512.40	MEAN	9.62	MAX	69	MIN	0.5	AC-FT	6970
WTR YR	2010	TOTAL	3211.30	MEAN	8.8	MAX	62	MIN	0.5	AC-FT	6370

MAX DISCH: 76 CFS AT 17:00 ON Aug. 02,2010 GH 1.32 FT. SHIFT 0.03 FT.

MAX GH: 1.67 FT. AT 18:15 ON Mar. 30,2010 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08224500 KERBER CREEK NEAR VILLA GROVE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
GARNER CREEK NEAR VILLA GROVE
Water Year 2010

Location.-- Lat. 38°10'27", Long. 105°48'29", UTM X 429172.3, Y 4225448.3, in SE ¼ SE ¼ Sec. 1, T.45 N., R.10 E., NMMPM, Saguache Co., on right bank, 12 miles SE of Villa Grove.

Drainage and Period of Record.-- 6.4 mi².

Equipment.-- Data collection platform (Sutron Satlink II) and a float-operated SDR shaft encoder in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well at a 2.5 ft Parshall Flume.. Gage height set by outside staff on flume. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from 15-minute DCP transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for November 6, 2009 through April 6, 2010 when the station was closed for the winter. Shaft encoder corrections found on Oct. 14, 2009, Apr. 27, May 19, and Jun. 29, 2010. The correction from Oct. 14, 2009 was manually prorated from Oct 3 2009 to allow for the distribution across the water year. The other corrections were prorated by time from the previous visit. One flush correction was identified on Jun. 7, 2010 and was applied back to a peak on May 29, 2010. Corrections varied from -0.01 ft to +0.01 ft. There were three corrections resulting from cleaning the flume; -0.01 ft on Oct. 14, 2009, -0.02 ft on Jul. 23, 2010, and a -0.09 ft on Oct. 13, 2010. These corrections were distributed by time as shift corrections.

Datum Corrections.-- A formal inspection with levels was not performed this year. Inspection and levels completed on the 2 foot Parshall flume on Jul. 24, 2008, indicate that the flume floor slopes down from the LEW at the staff to the well inlet by approximately 0.16 ft ($\pm 4.5\%$). Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- The flume and well ice up during winter, and sediment movement in and above control can cause minor shifting. Rating No. 1, a standard two foot Parshall flume rating, was used all year. The measurement shifts indicate consistent +0.08 to +0.10 ft shifts that are due to the sloping flume floor. Fifteen discharge measurements (Nos. 158-172) were made this year, ranging in discharge from 1.36 to 4.43 cfs with 1.48 cfs being the lowest measurement used for record development. The range in daily mean streamflow experienced this year was 1.3 to 4.4 cfs. Measurements cover the range experienced except for lower daily flows on Jul. 25 – 30, 2010. The instantaneous peak flow of 4.6 cfs occurred at 0945 on June 4, 2010 at a gage height of 0.60 ft (GH corr. +0.01 ft applied) with a shift of +0.10 ft. This flow also occurred June 10, 2010 at 08:45 at a gage height of 0.60 ft with a shift of +0.10 ft. The peak gage height exceeded high flow measurement 167 with a gage height of 0.58 ft by 0.02 ft. The minimum daily flow was 1.3 cfs and occurred on Jul. 25 - 30, 2010.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. All measurements were given full weight except measurements 165, 171, both rated fair, and adjusted 2% and 6% respectively, and measurement No. 172, rated poor, and adjusted 10% to smooth shift distribution, and 169, which was not used due to incorrect edges.

Special Computations.-- Winter streamflow record was estimated using 6 discharge measurements and temperature data from Sand Creek at Great Sand Dunes National Park (SANDUNCO).

Remarks.-- Record is good, except for periods of no gage-height, and periods when flow is less than 1.5 cfs, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GARNER CREEK NEAR VILLA GROVE

RATING TABLE--

GARVILCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

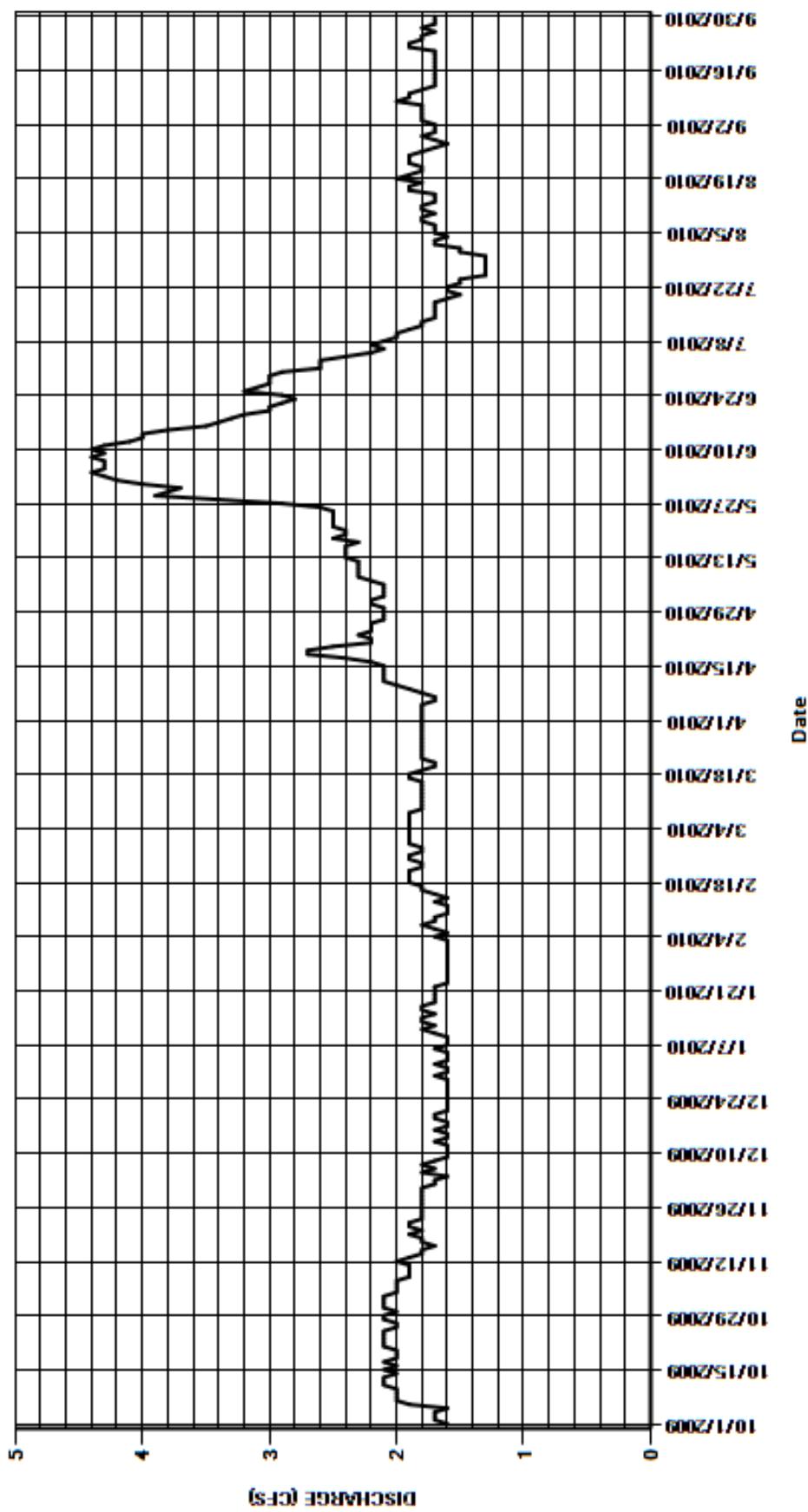
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.6	2.1	1.8	1.6	1.6	1.9	1.8	2.2	4	2.6	1.5	1.7
2	1.7	2.1	1.7	1.7	1.6	1.9	1.8	2.2	4.2	2.6	1.7	1.7
3	1.7	2.1	1.7	1.6	1.6	1.9	1.8	2.1	4.3	2.6	1.7	1.8
4	1.7	2	1.6	1.6	1.7	1.9	1.8	2.1	4.4	2.4	1.6	1.8
5	1.6	2	1.8	1.6	1.6	1.9	1.8	2.1	4.3	2.2	1.7	1.8
6	1.9	2	1.7	1.7	1.7	1.9	1.7	2.1	4.3	2.1	1.7	1.8
7	2	2	1.8	1.6	1.8	1.9	1.7	2.2	4.3	2.2	1.7	1.8
8	2	1.9	1.7	1.6	1.7	1.9	1.8	2.3	4.4	2.1	1.8	2
9	2	1.9	1.6	1.6	1.7	1.8	1.9	2.3	4.3	2	1.8	1.9
10	2	1.9	1.6	1.7	1.6	1.8	2	2.3	4.4	2	1.7	1.9
11	2.1	1.9	1.6	1.8	1.6	1.8	2.1	2.3	4.3	1.9	1.8	1.8
12	2.1	2	1.6	1.7	1.6	1.8	2.1	2.3	4.1	1.8	1.8	1.7
13	2.1	1.9	1.7	1.8	1.7	1.8	2.1	2.4	4	1.8	1.7	1.7
14	2	1.8	1.6	1.8	1.6	1.8	2.1	2.4	4	1.7	1.7	1.7
15	2.1	1.8	1.6	1.7	1.7	1.8	2.1	2.4	3.8	1.7	1.7	1.7
16	2	1.7	1.7	1.8	1.8	1.8	2.2	2.4	3.5	1.7	1.9	1.7
17	2.1	1.8	1.6	1.8	1.8	1.9	2.4	2.3	3.4	1.7	1.9	1.7
18	2	1.8	1.6	1.7	1.9	1.9	2.7	2.5	3.3	1.7	1.8	1.7
19	2	1.9	1.7	1.7	1.9	1.8	2.7	2.4	3.2	1.6	2	1.7
20	2	1.8	1.7	1.7	1.9	1.7	2.5	2.4	3	1.5	1.9	1.7
21	2.1	1.9	1.6	1.7	1.9	1.7	2.2	2.5	3	1.6	1.8	1.7
22	2.1	1.9	1.6	1.7	1.8	1.8	2.2	2.5	2.9	1.6	1.8	1.9
23	2.1	1.8	1.6	1.6	1.8	1.8	2.3	2.5	2.8	1.5	1.9	1.9
24	2.1	1.8	1.6	1.6	1.9	1.8	2.2	2.5	2.9	1.5	1.9	1.8
25	2.1	1.8	1.6	1.6	1.9	1.8	2.2	2.5	3.2	1.3	1.9	1.8
26	2	1.8	1.6	1.6	1.8	1.8	2.2	2.6	3.1	1.3	1.8	1.7
27	2	1.8	1.6	1.6	1.8	1.8	2.1	2.9	3	1.3	1.7	1.8
28	2.1	1.8	1.6	1.6	1.9	1.8	2.1	3.4	3	1.3	1.6	1.7
29	2.1	1.8	1.6	1.6	---	1.8	2.1	3.9	3	1.3	1.7	1.7
30	2	1.8	1.7	1.6	---	1.8	2.1	3.8	2.9	1.3	1.8	1.7
31	2.1	---	1.6	1.6	---	1.8	---	3.7	---	1.5	1.7	---
TOTAL	61.5	56.6	51.1	51.6	48.9	56.6	62.8	78.5	109.3	55.4	54.7	53.0
MEAN	1.98	1.89	1.65	1.66	1.75	1.83	2.09	2.53	3.64	1.79	1.76	1.77
AC-FT	122	112	101	102	97	112	125	156	217	110	108	105
MAX	2.1	2.1	1.8	1.8	1.9	1.9	2.7	3.9	4.4	2.6	2	2
MIN	1.6	1.7	1.6	1.6	1.6	1.7	1.7	2.1	2.8	1.3	1.5	1.7
CAL YR	2009	TOTAL	825.8	MEAN	2.26	MAX	5.5	MIN	1.2	AC-FT	1640	
WTR YR	2010	TOTAL	740.0	MEAN	2.03	MAX	4.4	MIN	1.3	AC-FT	1470	

MAX DISCH: 4.6 CFS AT 09:45 ON Jun. 04,2010 GH 0.6 FT. SHIFT 0.1 FT. (GH CORR. +0.01 FT. APPLIED)

MAX GH: 0.6 FT. AT 09:45 ON Jun. 04,2010 (GH CORR. +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GARNER CREEK NEAR VILLA GROVE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
MAJOR CREEK NEAR VILLA GROVE
Water Year 2010

Location.-- Lat. 38°09'26", Long. 105°48'32", UTM X 429083.2, Y 4223568.3, in NE ¼ NE ¼ Sec. 13, T.45 N., R.10 E., NMPM, Saguache Co., on right bank, 11 miles SE of Villa Grove.

Drainage and Period of Record.-- 5.0 mi².

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well. Primary reference gage is outside staff gage in 2-foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from 15-minute transmitted DCP data with DCP log and SDR log as backup. Record is complete and reliable except for November 6, 2009 through April 6, 2010 when gage was closed for winter. One instrument correction of -0.01 ft. was noted April 27, 2010 which was prorated back to the previous visit on April 6, 2010. Two flush corrections of +0.01 ft. were noted on June 7, 2010 and June 29, 2010. Due to the minor nature of these corrections they were prorated back to the previous visit, May 19, 2010 and June 7, 2010 respectively. One cleaning correction was noted July 23, 2010, and was applied as a datum correction and prorated over falling stage from rain event prior to visit.

Datum Corrections.-- A formal inspection with levels was not performed this year. The last formal inspection and levels were completed on July 24, 2008, with an assumed elevation of 0.000 at the flume staff gage (LEW) which is opposite the stilling well inlet (REW). Levels indicate that the flume floor slopes down from the LEW at the staff to the inlet by approximately 0.062 ft (Approx. 2%). The floor also slopes to the throat by .038 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- The control is a 2 foot Parshall flume in good condition. The flume and well ice up during winter, and sediment movement in and above control can cause minor shifting. Rating No. 1, a standard two foot Parshall flume rating, was used all year. Fifteen measurements (Nos. 159 – 173) were made this year ranging in discharge from 0.73 to 2.81 cfs. They cover the range in stage experienced except the higher daily flows of June 12-14, 2010. The first peak flow of 2.9 cfs occurred at 1000 on June 6, 2010 at a gage height of 0.50 ft (+0.01 ft GH correction applied) with a shift of +0.02 ft. It exceeded the stage of high flow measurement No. 168, made June 7, 2010 by 0.01 ft. This flow was computed numerous other occasions from June 6 to June 16, 2010. The minimum daily flow occurred December 2-4, 2009 (0.70 cfs, estimated from measurements and weather record).

Discharge.-- Shifting control method was used for all periods of good record. Shifting occurs primarily from filling and scour of approach section. Shifts were applied as defined by discharge measurements and distributed by time based on measurements and events. Measurements show shifts varied between -0.01 and +0.02 feet. All measurements were given full weight except for Nos's 169 and 170 which were adjusted as much as 3% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six discharge measurements and weather records.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor and June 29 through July 23 where record is fair due to large cleaning correction. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MAJOR CREEK NEAR VILLA GROVE

RATING TABLE--

MAJVILCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

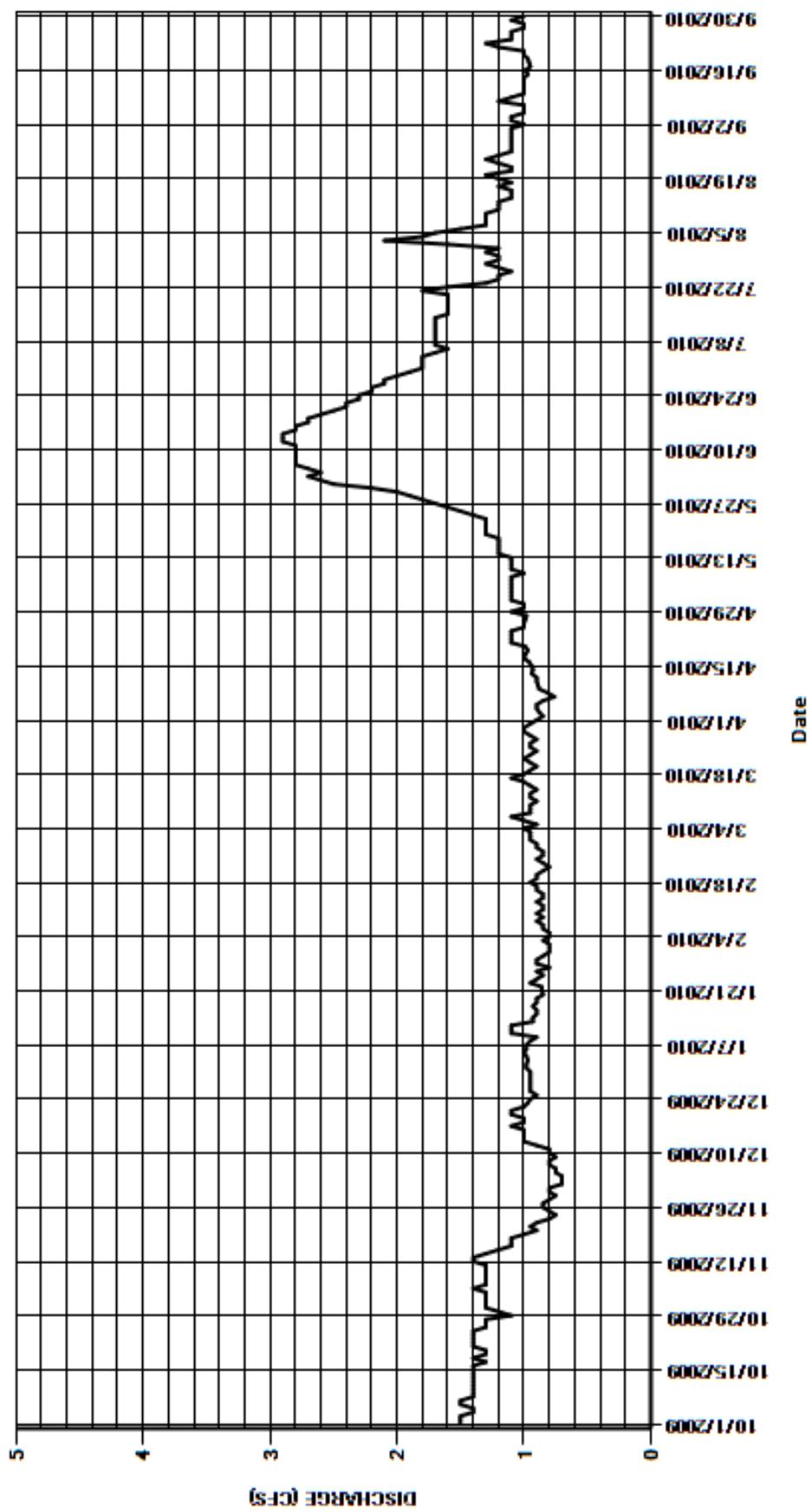
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	1.3	0.8	0.98	0.8	0.95	0.9	1	2.5	1.8	1.2	1.1
2	1.5	1.3	0.7	0.98	0.8	0.95	0.85	1.1	2.6	1.8	1.6	1
3	1.5	1.3	0.7	0.97	0.85	0.95	0.88	1.1	2.7	1.8	2.1	1.1
4	1.4	1.3	0.7	0.98	0.8	1	0.9	1.1	2.6	1.8	1.8	1.1
5	1.4	1.4	0.75	1	0.8	0.9	0.9	1.1	2.7	1.7	1.7	1
6	1.5	1.3	0.75	0.98	0.85	1	0.85	1.1	2.8	1.6	1.5	1
7	1.5	1.3	0.8	0.98	0.85	1.1	0.76	1.1	2.8	1.7	1.3	1
8	1.4	1.3	0.8	0.95	0.9	0.95	0.81	1.1	2.8	1.7	1.3	1.2
9	1.4	1.3	0.75	0.9	0.85	0.95	0.88	1	2.8	1.7	1.3	1.1
10	1.4	1.3	0.8	1.1	0.9	0.95	0.89	1.1	2.8	1.7	1.3	1
11	1.4	1.3	0.8	1.1	0.85	0.9	0.9	1.1	2.8	1.7	1.2	1
12	1.4	1.4	0.9	1.1	0.85	0.95	0.9	1.1	2.9	1.7	1.2	1
13	1.4	1.4	1	0.93	0.9	0.95	0.94	1.1	2.9	1.7	1.2	1
14	1.4	1.3	1	0.93	0.85	0.9	0.93	1.2	2.9	1.7	1.1	1
15	1.4	1.2	1	0.9	0.85	0.95	0.94	1.2	2.8	1.6	1.1	0.97
16	1.4	1.1	1	0.9	0.9	1	0.96	1.2	2.8	1.6	1.1	0.99
17	1.3	1.1	1.1	0.93	0.9	1.1	1	1.2	2.7	1.6	1.2	0.95
18	1.4	1.1	1	0.9	0.95	1	0.99	1.2	2.7	1.6	1.1	0.96
19	1.3	1	1	0.9	0.9	0.95	0.97	1.3	2.6	1.6	1.2	0.97
20	1.3	0.9	1.1	0.85	0.9	0.9	0.99	1.3	2.5	1.6	1.3	1
21	1.4	0.95	1.1	0.86	0.85	0.95	1.1	1.3	2.4	1.8	1.1	1
22	1.4	0.9	1	0.86	0.8	1	1.1	1.3	2.4	1.6	1.1	1.2
23	1.4	0.8	0.97	0.95	0.85	0.95	1.1	1.3	2.3	1.3	1.2	1.3
24	1.4	0.75	0.95	0.9	0.9	0.9	1.1	1.4	2.3	1.2	1.3	1.1
25	1.4	0.8	0.9	0.85	0.85	0.95	1	1.5	2.2	1.2	1.2	1.1
26	1.3	0.85	0.95	0.9	0.85	0.95	1	1.6	2.2	1.1	1.1	1.1
27	1.3	0.85	0.95	0.8	0.9	0.9	0.99	1.7	2.1	1.2	1.1	1
28	1.3	0.8	0.95	0.9	0.9	0.95	0.98	1.8	2.1	1.3	1.1	1
29	1.1	0.75	0.95	0.9	---	1	1.1	1.9	2	1.2	1.1	1.1
30	1.2	0.8	0.95	0.85	---	1	1	2	1.9	1.2	1.1	1
31	1.3	---	0.95	0.8	---	0.95	---	2.2	---	1.3	1.1	---
TOTAL	42.7	33.15	28.07	28.83	24.15	29.80	28.61	40.7	76.6	48.1	39.3	31.34
MEAN	1.38	1.1	0.91	0.93	0.86	0.96	0.95	1.31	2.55	1.55	1.27	1.04
AC-FT	85	66	56	57	48	59	57	81	152	95	78	62
MAX	1.5	1.4	1.1	1.1	0.95	1.1	1.1	2.2	2.9	1.8	2.1	1.3
MIN	1.1	0.75	0.7	0.8	0.8	0.9	0.76	1	1.9	1.1	1.1	0.95

CAL YR	2009	TOTAL	570.90	MEAN	1.56	MAX	4.7	MIN	0.43	AC-FT	1130
WTR YR	2010	TOTAL	451.35	MEAN	1.24	MAX	2.9	MIN	0.7	AC-FT	895

MAX DISCH: 2.9 CFS AT 10:00 ON Jun. 06,2010 GH 0.5 FT. SHIFT 0.02 FT. (GH CORR. +0.01 FT. APPLIED)
 MAX GH: 0.5 FT. AT 10:00 ON Jun. 06,2010 (GH CORR. +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MAJOR CREEK NEAR VILLA GROVE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
Water Year 2010

Location.-- Lat. 38°07'55", Long. 105°47'15", UTM X 430884.8, Y 4220748.2, in Sec. 20, T.45 N., R.11 E., NMPM, Saguache Co., on left bank of channel approximately 300 feet North of road, 9 miles SE of Mineral Hot Springs.

Drainage and Period of Record.-- 12.8 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink2 with HDR GOES radio), and a float-operated shaft encoder in a 48 inch diameter metal shelter and well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except when the station was closed for the winter Nov. 24, 2009 through Apr. 6, 2010; Oct. 29, 30, Nov. 16-18, 2009, when the stage-discharge relationship was affected by ice; and Jun. 6, 7, 2010, when the inlets were plugged. The peak discharge and gage height occurred on the early morning of Jun. 6, 2010 before the inlets became plugged in the afternoon. There was one -0.02 ft. trash correction taken as a datum correction and prorated by time from the previous visit. There was also a +0.11 ft flush correction applied to help estimate the flow on two "a" days in June.

Datum Corrections.-- Levels were not run at this site during this water year. Levels were last run to the Reference Point (RP) inside the gage on Sep. 4, 2009 using B.M. No. 2 as base. The gage reference point elevation was within allowable limits, therefore no correction was made.

Rating.-- The control at all stages is rock piled in stream channel 10 feet below gage. Some minor shifting of control will occur from movement of rocks. Rating No. 04-1 was used again this water year. Fifteen discharge measurements (Nos. 168-182) were made during the year ranging in discharge from 5.01 to 48.8 cfs. They cover the range experienced except for the lower daily flows on Dec. 4, 25-28, 2009, Jan. 24-31, Feb. 1-28, Mar. 1-16, 20-29, Apr. 2-6, 2010 and the higher daily flows on May 29, Jun. 6-8, 2010. The peak flow of 67.9 cfs occurred at 0030 on June 6, 2010 at a gage height of 3.67 ft. with a shift of 0.09 ft. It exceeded high measurement No. 177 (GH=3.47 ft), made June 7, 2010, by 0.20 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Two shift curves, COCRMICOVSC1001 and COCRMICOVSC1002, were used to distribute shifts according to stage from Apr. 6 to Jun. 7, and Jun. 7 to Aug. 31, respectively. During other periods, shifts were defined by measurements and distributed by time. All shifts were given full weight and applied as defined except for Nos. 168, 178, 179, and 180, which were adjusted by as much as 7% to smooth shift distribution. Measured shifts ranged from -0.06 to +0.09 feet.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using six discharge measurements and weather records.

Remarks.-- Record is good, except for periods of no gage-height, including period when inlets were plugged, and ice affected record, which are poor. Periods of discharge between 20 and 50 cfs should be considered fair due to lack of discharge measurements in that range. Periods of discharge greater than 50 cfs, including the peak discharge, should be considered poor. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS

RATING TABLE--

COCRMICO04-1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	6.8	6	5.2	4.4	4.6	5	6.5	37	13	18	10
2	10	7.2	5.6	5.2	4.2	4.6	4.8	6.5	33	13	26	10
3	10	7.1	5.2	5.2	4.4	4.6	4.8	6.4	30	14	26	10
4	10	7.1	4.8	5.2	4.4	4.8	4.8	6.5	36	13	27	9.9
5	9.9	7.1	5	5.2	4.4	4.8	4.8	7.3	49	12	35	9.5
6	9.8	7.2	5.2	5.4	4.4	4.8	4.8	8.1	55	12	28	9.1
7	9.9	7.2	5.4	5.4	4.4	4.8	5	7.7	56	11	24	9.1
8	10	7.1	5.2	5.4	4.4	4.8	5.2	8.7	52	11	22	11
9	10	7.1	5.2	5.2	4.4	4.6	5.4	9.4	48	11	20	11
10	9.4	7.1	5.2	5.2	4.2	4.4	5.6	11	43	11	18	9.9
11	9.2	7.1	5	5.4	4.2	4.4	5.9	10	35	11	16	9.4
12	9.1	7.1	5.2	5.4	4.2	4.2	6.3	11	31	10	15	9.3
13	9.4	7.1	5.4	5.4	4.4	4.4	6.2	11	28	10	15	9.2
14	9.2	7.1	5.2	5.4	4.4	4.6	5.8	9.7	24	10	14	9
15	9.1	7	5	5.4	4.2	4.8	6.5	9	21	9.7	13	8.9
16	9	6.4	5	5.2	4.4	4.8	7.1	8.7	21	9.4	13	8.5
17	8.8	6.4	5	5.2	4.4	5	7.4	11	21	9.6	13	8.4
18	8.6	6.8	5.2	5.2	4.6	5.2	6.8	13	21	9.8	12	8.5
19	8.2	6.8	5	5	4.6	5	7	13	21	9.6	12	8.5
20	8.1	6.8	5.2	5.2	4.8	4.8	7.4	13	20	9.5	13	8.5
21	8.2	6.8	5.4	5.2	4.8	4.6	7.6	19	20	11	12	8.4
22	9.8	6.8	5.4	5.2	4.2	4.8	8.5	23	19	12	11	9.9
23	9.7	6.7	5.6	5.2	3.8	4.8	8	28	18	11	11	12
24	9.6	6.6	5	4.8	3.8	4.8	7.3	29	18	11	12	11
25	9.2	6.6	4.6	4.4	4	4.8	6.8	23	18	11	11	10
26	8.5	6.8	4.8	4.2	4.2	4.8	6.6	25	17	11	11	9.8
27	8.5	6.8	4.8	4.4	4.2	4.8	6.6	32	16	11	10	9.8
28	8.7	6.8	4.8	4.6	4.4	4.8	6.9	43	16	12	10	9.4
29	8.6	6.4	5	4.6	---	4.8	7.3	52	15	11	10	9.2
30	6.6	6.2	5	4.6	---	5	6.8	46	14	13	11	9.1
31	5.7	---	5	4.6	---	5.2	---	38	---	16	11	---
TOTAL	280.8	206.1	159.4	157.2	121.2	147.2	189.0	545.5	853	349.6	500	286.3
MEAN	9.06	6.87	5.14	5.07	4.33	4.75	6.3	17.6	28.4	11.3	16.1	9.54
AC-FT	557	409	316	312	240	292	375	1080	1690	693	992	568
MAX	10	7.2	6	5.4	4.8	5.2	8.5	52	56	16	35	12
MIN	5.7	6.2	4.6	4.2	3.8	4.2	4.8	6.4	14	9.4	10	8.4

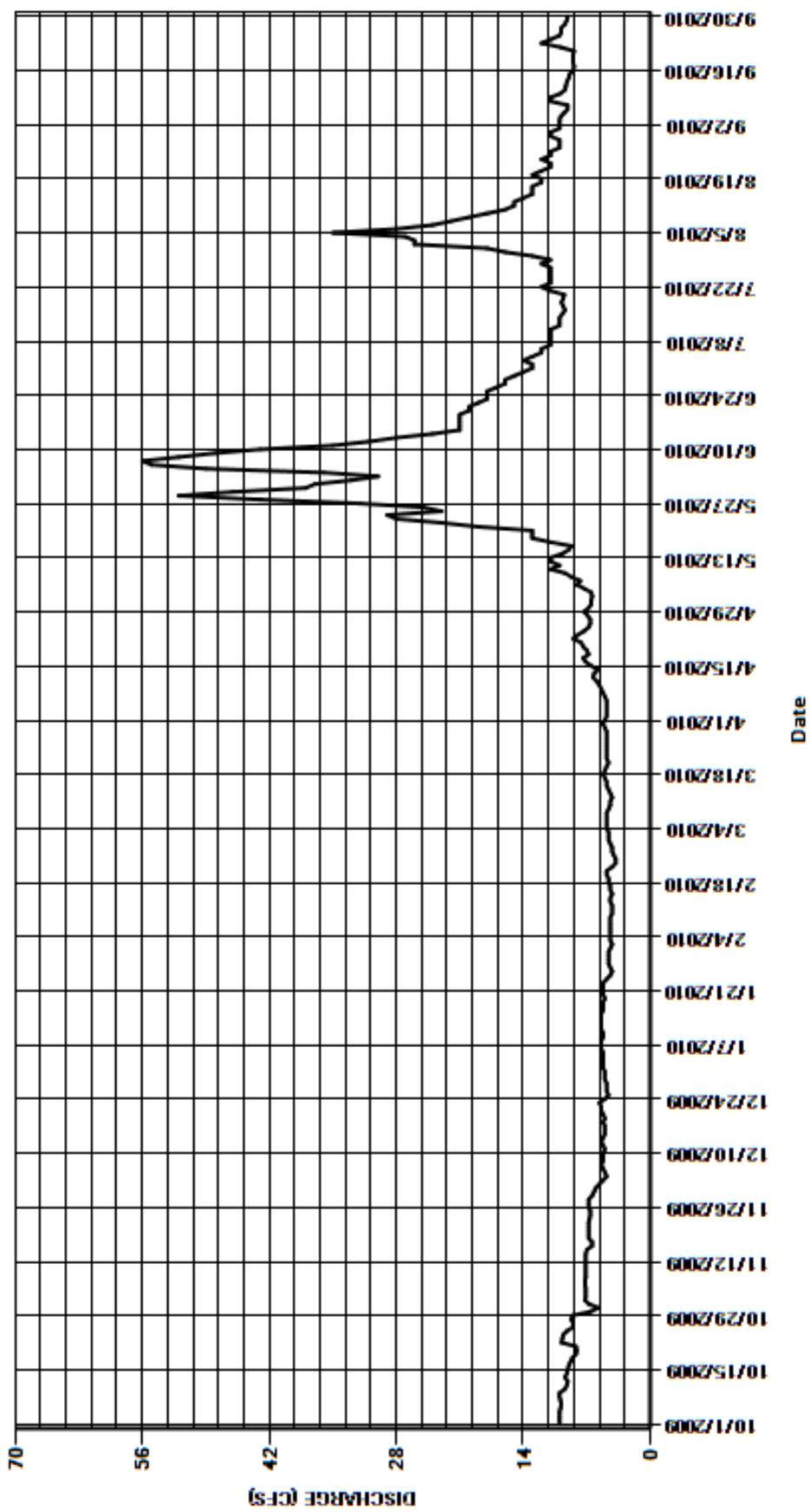
CAL YR	2009	TOTAL	4418.2	MEAN	12.1	MAX	79	MIN	3.6	AC-FT	8760
WTR YR	2010	TOTAL	3795.3	MEAN	10.4	MAX	56	MIN	3.8	AC-FT	7530

MAX DISCH: 67.9 CFS AT 00:30 ON Jun. 06,2010 GH 3.67 FT. SHIFT 0.09 FT.

MAX GH: 3.67 FT. AT 00:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILD CHERRY CREEK NEAR CRESTONE
Water Year 2010

Location.--	Lat. 38°06'01", Long. 105°46'04", UTM X 432633.1, Y 4217219.0, SW ¼ SW ¼ Sec. 33, T.45 N., R.11 E., N.M.P.M., Saguache Co., on right bank of channel approximately 50 feet North of right branch of trail, 12 miles SE of Mineral Hot Springs, 8 miles NW of Crestone.
Drainage and Period of Record.--	4.5 mi ² .
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model Satlink2 Logger with HDR GOES radio) and a float-operated shaft encoder in a 4-foot diameter culvert pipe well and shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backups. Record is complete and reliable except for Nov. 24, 2009 through April 6, 2010 when station was closed for the winter. There was a +0.01 ft shaft encoder correction on Sept. 20, which was prorated back to the previous measurement on Aug. 31. There were trash corrections of -0.08 ft. (branch on control) on Oct. 14, 2009 and of -0.05 ft. (leaves on control) on Apr. 27, 2010. These corrections were accounted for in the shift distributions.
Datum Corrections.--	No levels were run at this site during W.Y.2010. Levels were last run to the Reference Point (RP) inside the gage on Sep. 4, 2009 using B.M. 1 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made.
Rating.--	Control at all stages was a rock weir about 3 feet below the gage until Aug. 10, 2010 when the control was moved downstream 3 feet and reshaped. As soon as enough measurements are made a new rating table will be developed for this site. Shifting occurs due to scour, fill, and movement of rocks. Rating No. 2 was used for the entire year. Sixteen discharge measurements (Nos. 166-181) were made this year ranging in discharge from 0.21 to 13.9 cfs. They cover the discharge range experienced except for the higher daily flows on May 27-31, June 1, 2, 5-7, 2010. The peak flow of 33.4 cfs occurred at 2045 on May 29, 2010 at a gage height of 2.65 ft. with a shift of -0.06 ft. It exceeded high measurement No. 175 (GH=2.44 ft), made June 7, 2010, by 0.21 ft. in stage.
Discharge.--	Shifting control method was used during all open water periods. A shift curve was used to apply shifts according to stage from Aug. 10 to Sep. 22, 2010. During other periods, shifts were applied as defined by measurements and distributed by time and events. Measurements show shifts varied from -0.06 to +0.06 feet before the control was moved and reshaped and +0.31 ft. to +0.41 ft. after the control was moved and reshaped. All were given full weight except for No. 179 which was adjusted by 8% (fair measurement) to better fit shift curve.
Special Computations.--	Periods of no gage-height and ice affected record were estimated using six discharge measurements and weather records.
Remarks.--	Due to instability of control and uncertainty in measurements, record is fair except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars and Andrea Taillacq.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILD CHERRY CREEK NEAR CRESTONE

RATING TABLE--

CHECRECO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

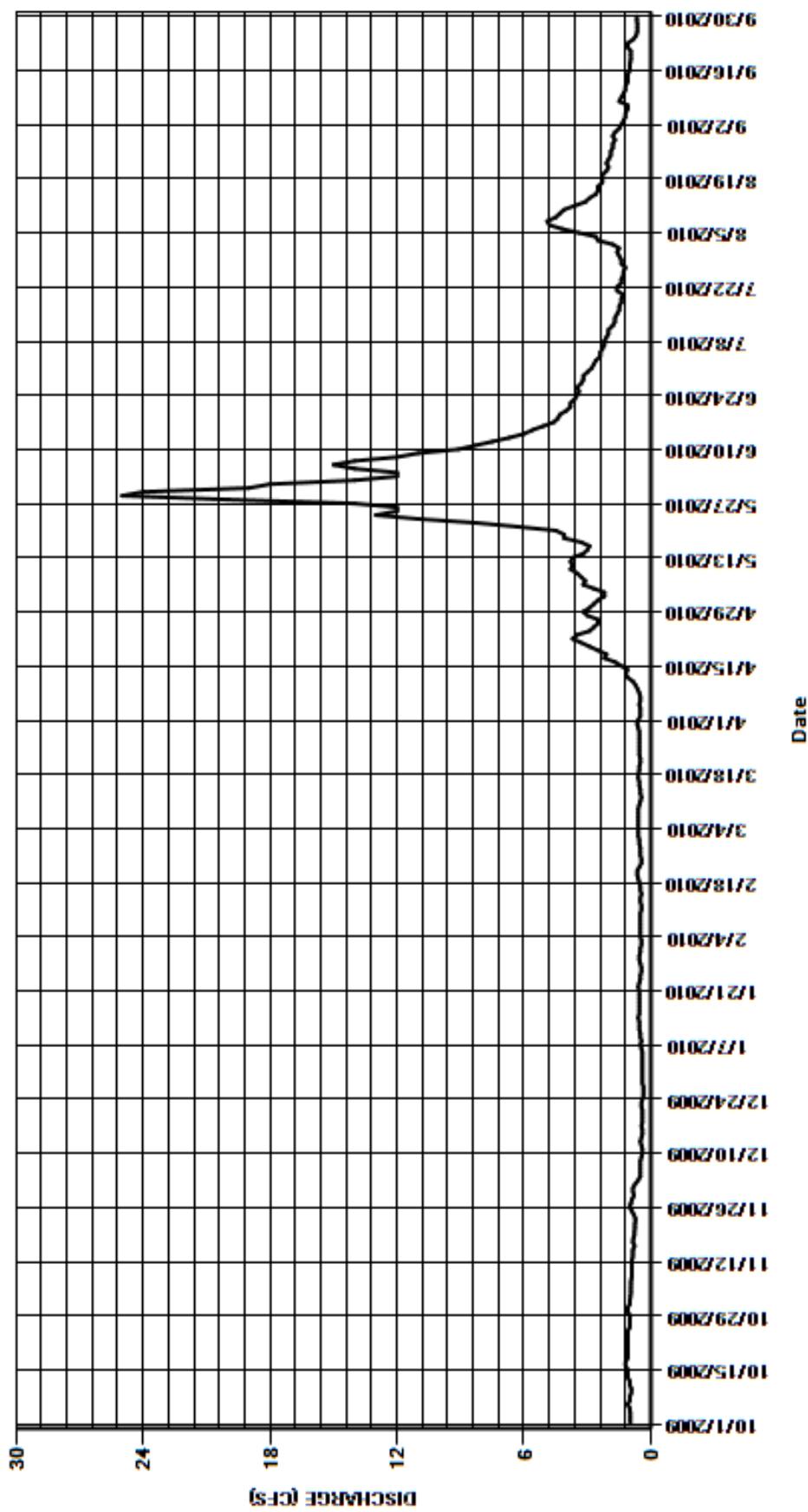
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.97	1	0.85	0.4	0.5	0.55	0.6	2.7	18	2.8	1.5	1.5
2	0.98	0.99	0.75	0.4	0.45	0.6	0.5	2.5	14	2.7	1.8	1.4
3	0.98	0.97	0.6	0.4	0.45	0.6	0.5	2.2	12	2.6	2.5	1.3
4	0.98	0.95	0.5	0.4	0.5	0.6	0.5	2.2	12	2.4	2.6	1.2
5	1	0.95	0.5	0.4	0.5	0.6	0.55	2.7	14	2.4	3.4	1.2
6	1.1	0.94	0.5	0.45	0.5	0.6	0.5	3.2	15	2.3	4.2	1.1
7	1	0.94	0.5	0.5	0.5	0.6	0.5	3.1	14	2.2	4.8	1.1
8	1	0.91	0.5	0.45	0.5	0.6	0.55	3.3	12	2.2	4.9	1.5
9	0.93	0.91	0.45	0.5	0.5	0.6	0.63	3.5	11	2.1	4.5	1.4
10	0.92	0.91	0.4	0.5	0.5	0.55	0.73	3.8	9.1	2	4.3	1.3
11	1	0.91	0.4	0.55	0.45	0.5	0.85	3.7	8.3	2	4.1	1.2
12	1	0.91	0.45	0.55	0.45	0.45	1.1	3.8	7.5	1.8	3.6	1.2
13	1.1	0.87	0.5	0.55	0.5	0.5	1.2	3.7	6.7	1.7	3.1	1.1
14	1.1	0.86	0.45	0.6	0.5	0.5	1.1	3.2	6	1.7	2.9	1.1
15	1.1	0.85	0.4	0.55	0.45	0.55	1.4	3	5.6	1.6	2.6	1.1
16	1.2	0.77	0.4	0.55	0.5	0.55	1.7	2.9	5.1	1.5	2.5	1
17	1.2	0.85	0.45	0.55	0.5	0.6	2.2	3.3	4.6	1.5	2.5	1
18	1.1	0.83	0.4	0.55	0.55	0.6	2.1	4.1	4.4	1.4	2.3	0.98
19	1.1	0.77	0.4	0.55	0.6	0.55	2.5	4.1	4.3	1.4	2.3	0.95
20	1.1	0.77	0.4	0.55	0.65	0.55	2.9	4.5	4	1.3	2.3	0.96
21	1.1	0.76	0.4	0.55	0.65	0.5	3.3	6.3	3.8	1.6	2.1	0.95
22	1.1	0.75	0.45	0.6	0.55	0.5	3.7	8.3	3.8	1.6	2	1.1
23	1.1	0.73	0.45	0.55	0.45	0.55	3.5	11	3.6	1.4	2.1	1.1
24	1.1	0.8	0.4	0.5	0.45	0.55	2.9	13	3.5	1.4	2	0.84
25	1.1	0.9	0.35	0.5	0.5	0.55	2.7	12	3.4	1.3	1.9	0.7
26	1	1	0.35	0.45	0.5	0.55	2.5	12	3.5	1.3	1.9	0.65
27	1	0.95	0.35	0.45	0.5	0.55	2.5	14	3.3	1.2	1.8	0.65
28	1	0.9	0.4	0.5	0.55	0.55	3	20	3.2	1.4	1.8	0.65
29	0.98	0.8	0.4	0.55	---	0.55	3.2	25	3.2	1.4	1.7	0.66
30	1.1	0.85	0.4	0.55	---	0.6	2.9	24	3	1.5	1.8	0.67
31	1.1	---	0.4	0.5	---	0.65	---	19	---	1.6	1.7	---
TOTAL	32.54	26.30	14.15	15.65	14.20	17.35	52.81	230.1	221.9	55.3	83.5	31.56
MEAN	1.05	0.88	0.46	0.5	0.51	0.56	1.76	7.42	7.4	1.78	2.69	1.05
AC-FT	65	52	28	31	28	34	105	456	440	110	166	63
MAX	1.2	1	0.85	0.6	0.65	0.65	3.7	25	18	2.8	4.9	1.5
MIN	0.92	0.73	0.35	0.4	0.45	0.45	0.5	2.2	3	1.2	1.5	0.65
CAL YR	2009	TOTAL	1121.79	MEAN	3.07	MAX	20	MIN	0.3	AC-FT	2230	
WTR YR	2010	TOTAL	795.36	MEAN	2.18	MAX	25	MIN	0.35	AC-FT	1580	

MAX DISCH: 33.4 CFS AT 20:45 ON May. 29,2010 GH 2.65 FT. SHIFT -0.06 FT.

MAX GH: 2.65 FT. AT 20:45 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILD CHERRY CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
RITO ALTO CREEK NEAR CRESTONE
Water Year 2010

Location.--	Lat. 38°04'39", Long. 105°45'43", UTM X 433123.0, Y 4214688.1, in SW1/4NE1/4 Sec. 9, T.44 N., R.11 E., NMPM, Saguache Co., on right bank of channel approximately 300 feet East of parking area, 12 miles SE of Mineral Hot Springs, 7 miles NW of Crestone.
Drainage and Period of Record.--	10.3 mi ² .
Equipment.--	Graphic water stage recorder, data collection platform (SatLink Data Logger with HDR GOES radio), and a float-operated shaft encoder in a 4 ft. diameter culvert pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for November Nov. 24, 2009 through April Apr. 7, 2010 when station was closed for the winter and June 29-30, 2010 when well was potentially isolated. There were two small shaft encoder corrections; a +0.01 ft on May 19 and a -0.01 ft on Aug. 10. These corrections were prorated by time from the previous visit.
Datum Corrections.--	Levels were last run to the Reference Point (RP) inside the gage on September 4, 2009 using B.M. No. 1 as base. The RP elevation was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009.
Rating.--	Station is a site with rock and cobble channel, steep banks are a controlling feature at high flows. Large boulders 6 to 10 feet below gage were the control prior to the control washing out in May. The control was rebuilt using boulders on June 30, 2010 however the control failure caused the control to be moved upstream approximately 4 feet such that the control was almost on the gage intakes, gage intakes were extended upstream of control August 10, 2010. Rating 4 was used to develop the record for WY2010; however a new rating will need to be developed for this site once high flow measurements can be made with the new control. During low flows minor shifting occurs as a result of streambed movement and debris build up on the control. Sixteen measurements (No. 166 through 181) were made during the 2010 water year ranging in discharge from 2.40 cfs to 101 cfs. These cover the range in flow experienced except for lower daily flows on Dec. 25, 2009, Jan. 20–24, 28, Mar. 20, 21, 25–28, 31, 2010, Apr. 2–3, 6–9, 2010 and higher daily flows on May 27–30, 2010 and June 5, 6, 2010. The peak flow of 238 cfs occurred at 2100 on May 28, 2010 at a gage height of 3.45 feet with a shift of -0.01 ft (from extrapolated rating 4). Rating 4 was not extended because of the control change requiring a new rating 5 to be developed. The peak exceeded high measurement No. 175 (GH=2.76 ft.) made June 6, 2010 by 0.69 ft. in stage.
Discharge.--	The shift from WY2009 was continued to measurement 166 on October 14, 2009 with a -4% difference by manually prorating for October 1, 2009. From October 14, 2009 until the gage was closed on November 11, 2009 three shift curves were used to shift for leaves building up on the control and leaf removal from the control. A V-diagram shift curve, RITCRECO-10-4 was developed using measurements 172, 173, and 174 and applied from April 8, 2010 to May 22, 2010 where hydrographic comparison indicates the control started to fail. RITCRECO-10-6 shift curve was developed from measurements 175 and 176 and applied from May 31, 2010 to June 30, 2010 when the control was rebuilt. RITCRECO-10-5 is a prorated curve based on noted changing in stage on May 22, 2010 and was applied from May 22, 2010 to May 31, 2010. June 30, 2010 was estimated from available record and measurements 176 and 177. It is likely that additional failure points were present during this period, but could not be identified from stage record and hydrographic comparison (as a result the period of record between May 19, 2010 and June 30, 2010 is considered poor). After the control was rebuilt June 30, 2010 shifting control method was applied to compute the record since no measurement data is available to develop a new rating. Shifting control method was used from June 30, 2010 to September 30, 2010. This method was applied because it appears the control has not stabilized from being rebuilt and relatively minor shift changes allow this method to be appropriately applied. All measurements were given full weight except measurement 166 which was discounted -4% to smooth the distribution.
Special Computations.--	Periods of no gage-height record were estimated using 7 discharge measurements, comparison with surrounding discharge records, and temperature record from Medano Creek at Great Sand Dunes National Park (MEDSANCO).
Remarks.--	Record is fair, except for periods of no gage-height and Jul. 30 to Aug. 11, 2010, which are poor. The period of May 19 to June 30, including peak discharge, should also be considered poor due to uncertainty of control conditions. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RITO ALTO CREEK NEAR CRESTONE

RATING TABLE--

RITCRECO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.1	4.6	3.9	2.6	2.5	2.6	2.5	5.2	86	14	12	6.9
2	5.3	4.6	3.5	2.6	2.5	2.6	2.3	5	70	14	17	6.4
3	5.4	4.4	3.2	2.6	2.5	2.6	2.3	4.8	66	14	17	6.1
4	5.3	4.4	3	2.5	2.6	2.7	2.4	5.1	88	12	22	5.6
5	5.2	4.4	3.1	2.6	2.6	2.6	2.4	6.4	108	11	31	5.4
6	5.2	4.5	3.2	2.5	2.5	2.7	2.3	7.4	106	10	25	5.2
7	5.5	4.6	3.2	2.5	2.5	2.7	2.3	7.4	98	10	22	5
8	5.6	4.5	3.1	2.4	2.5	2.6	2.3	8.7	89	11	26	7.8
9	5.6	4.4	2.9	2.5	2.5	2.6	2.2	9.9	83	9.4	22	7.4
10	5.4	4.3	2.8	2.6	2.4	2.7	2.7	13	71	9	19	6.2
11	5.2	4.3	2.9	2.6	2.4	2.6	3.2	12	57	8.8	16	5.7
12	4.9	4.3	2.6	2.6	2.5	2.7	4.2	13	48	8.2	15	5.5
13	5.2	4.3	2.7	2.6	2.4	2.6	4	14	43	7.3	13	5.3
14	5.1	4.3	2.5	2.5	2.4	2.7	3.6	11	34	7.2	12	5.1
15	5.1	4.3	2.4	2.6	2.4	2.6	5	10	28	6.5	11	4.9
16	4.9	4.2	2.4	2.6	2.5	2.6	6.4	10	29	5.9	11	4.9
17	5	4.6	2.5	2.6	2.5	2.6	6.5	14	28	5.4	11	4.6
18	4.8	4.3	2.4	2.5	2.5	2.6	5.7	19	27	5.1	9.8	4.5
19	4.8	4.2	2.4	2.4	2.5	2.4	5.6	17	25	5	10	4.4
20	4.7	4.1	2.5	2.3	2.4	2.2	6.1	21	24	4.7	11	4.7
21	4.4	4.1	2.5	2.3	2.4	2.2	7	42	23	6.4	9.2	4.9
22	4.9	4.1	2.4	2.3	2.4	2.6	7.8	64	21	9.4	8.5	6.6
23	5.2	4.1	2.4	2.3	2.5	2.7	7.9	87	18	8	8.8	11
24	5.1	4.1	2.4	2.3	2.5	2.6	6.8	85	18	6.1	8.6	8.4
25	4.9	4.1	2.3	2.4	2.4	2.3	6.1	63	17	5.2	8.2	7.4
26	4	4.1	2.4	2.4	2.5	2.3	5.7	75	17	4.8	7.8	7.3
27	4.2	4.1	2.5	2.4	2.5	2.2	5.5	115	15	4.4	7.3	7.1
28	4.4	3.9	2.5	2.3	2.5	2.3	5.8	163	14	5.9	7.1	7
29	4.5	3.8	2.5	2.4	---	2.4	5.9	140	14	5.4	7	7
30	4.3	3.8	2.4	2.4	---	2.5	5.5	109	14	8.3	8.4	7
31	4.5	---	2.4	2.5	---	2.3	---	96	---	12	7.7	---
TOTAL	153.7	127.8	83.9	76.7	69.3	78.4	138.0	1252.9	1379	254.4	421.4	185.3
MEAN	4.96	4.26	2.71	2.47	2.48	2.53	4.6	40.4	46	8.21	13.6	6.18
AC-FT	305	253	166	152	137	156	274	2490	2740	505	836	368
MAX	5.6	4.6	3.9	2.6	2.6	2.7	7.9	163	108	14	31	11
MIN	4	3.8	2.3	2.3	2.4	2.2	2.2	4.8	14	4.4	7	4.4

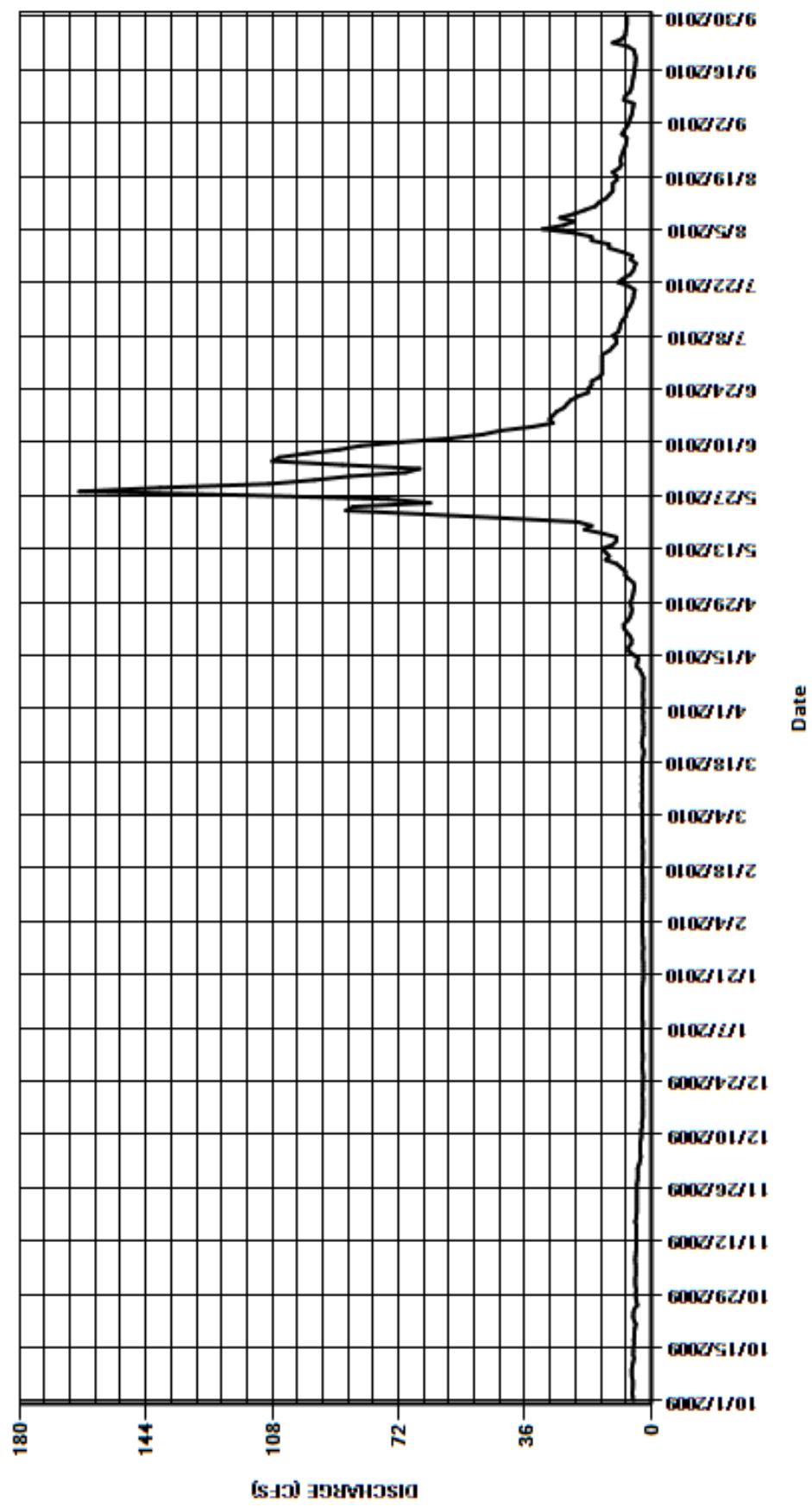
CAL YR	2009	TOTAL	4669.9	MEAN	12.8	MAX	103	MIN	1.8	AC-FT	9260
WTR YR	2010	TOTAL	4220.8	MEAN	11.6	MAX	163	MIN	2.2	AC-FT	8370

MAX DISCH: 238 CFS AT 21:00 ON May. 28,2010 GH 3.45 FT. SHIFT -0.01 FT.

MAX GH: 3.45 FT. AT 21:00 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RITO ALTO CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
SAN ISABEL CREEK NEAR CRESTONE

Water Year 2010

Location.-- Lat. 38°02'04", Long. 105°43'03", UTM X 436984.9, Y 4209879.0, in NE1/4,NW1/4, sec. 25 T.44 N., R.11 E., NMPM, Saguache Co., on left bank of channel approximately 200 feet NW of trail, 3 miles NW of Crestone.

Drainage and Period of Record.-- 5.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink2 with HDR GOES radio) and a float-operated shaft encoder in a 4-foot diameter culvert shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 24, 2009 – Apr. 7, 2010 when station was closed for winter. The stage-discharge relation was affected by ice Nov. 16-17, 2009. There were three small shaft encoder corrections; -0.01 ft on Apr. 30, +0.01 ft on Aug. 12 and -0.01 ft on Aug. 31, which prorated back to the previous visit. There was a flush correction on Jun. 7 prorated back to the previous inflection point.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable tolerance, so no correction was made.

Rating.-- Control is a boulder/cobble weir at low and medium flows, with some bank effect at higher flows. Stream bottom is mostly rounded rocks, cobbles, and gravel. The stage-discharge relation can be affected by persons moving rocks and piling logs on control and scour caused by high flows. Rating SANCRECO03 was used again this year from the beginning of the water year to 1945 May 28, 2010, when the control scoured. Rating SANCRECO04 was used from 2000 May 28 to the end of the water year. Rating SANCRECO03 is fairly well defined from 3 to 50 cfs. Rating SANCRECO04 was developed from measurements 178 through 185, the open water measurements available at the time of rating creation and after the scour event. SANCRECO04 was extended to a gage height of 4.56 ft. by evaluation of control scour and rating SANCRECO03 and was selected from SANCRECO03 with the -0.08 ft. change applied. The highest flow measured at this site of 52.4 cfs was measured on June 7, 2010, which exceeded the previous highest measurement of 51.8 cfs made on May 29, 2003. Fifteen discharge measurements (Nos. 169-183) were made this year, ranging in discharge from 1.64 to 52.4 cfs. They cover the discharge range experienced, except for higher daily flows on May 28-30 and lower daily flows Dec. 15-31, 2009, Jan. 1-31, Feb. 1-22, Mar. 6-17, 2010. The peak flow of 108 cfs occurred at 1945 on May 28, 2010 at a gage height of 4.66 ft with a shift of +0.08 ft. on Rating SANCRECO03. It exceeded high measurement No. 178 (GH = 4.27), made June 7, 2010, by 0.39 feet in stage. The minimum daily flow was 1.3 cfs on Dec. 21, 2009 and Jan 16, 2010.

Discharge.-- Shifting-control method was used for all periods of open water record. Shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied from -0.03 to +0.05 ft. All were given full weight except for Nos. 175, 176, and 181 which were adjusted by as much as 6% to smooth shift distribution. One trash correction was noted May 19, 2010 and was prorated back to the previous visit by time as a corrected shift.

Special Computations.-- The control failure was identified by evaluation of the hydrograph in comparison with North Crestone Creek near Crestone and was prorated between two events, the first on May 27 and the second on May 28. Hydrographic comparison with North Crestone Creek was used for winter estimates along with temperature data from Sand Creek at Great Sand Dunes National Park (SANDUNCO).

Remarks.-- Record is good, except for flows greater than 10 cfs which are fair, and periods of no gage-height and ice affected record, which are poor. The instantaneous peak gage height is also considered poor due to the control failing at or near the time of the peak. Because this site is flashy and few measurements have been made with the current control conditions combined with the control failing at multiple time during high flow the record was downgraded above 10 cfs. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .

Recommendations.-- Medium and high flow measurements are needed to better define the upper end of the rating after the control failed during high water this year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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SAN ISABEL CREEK NEAR CRESTONE

RATING TABLE--

SANCRECO03 USED FROM 01-Oct-2009 TO 28-May-2010
SANCRECO04 USED FROM 28-May-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.4	2.6	1.9	1.4	1.5	1.7	2.3	5.1	38	5.5	4	2.4
2	2.5	2.7	2	1.4	1.4	1.7	2.4	4.7	31	5.4	3.7	2.3
3	2.5	2.7	1.9	1.4	1.4	1.7	2.4	4.4	30	5.3	4.1	2.3
4	2.5	2.7	1.8	1.4	1.4	1.7	2	4.9	41	5	4	2.2
5	2.4	2.7	1.8	1.4	1.5	1.7	2	7.2	51	4.8	4.5	2.1
6	2.4	2.7	1.8	1.4	1.5	1.6	1.9	9	45	4.6	4	1.9
7	2.5	2.7	1.9	1.4	1.5	1.5	1.9	8.7	41	4.8	3.6	1.9
8	2.7	2.6	1.9	1.4	1.5	1.6	2.1	9.5	39	5	4.2	2.6
9	2.6	2.5	1.8	1.4	1.5	1.6	2.6	10	37	4.7	3.8	2.6
10	2.6	2.4	1.8	1.4	1.5	1.5	3.1	14	32	4.5	3.6	2.3
11	2.5	2.4	1.8	1.4	1.5	1.5	3.7	12	25	4.4	3.4	2.2
12	2.4	2.3	1.7	1.4	1.5	1.4	4.2	12	21	4.2	3.3	2.1
13	2.6	2.3	1.7	1.4	1.5	1.4	4.2	12	19	3.9	3.1	2.1
14	2.5	2.2	1.7	1.4	1.6	1.4	3.9	10	15	4	3	2
15	2.5	2.2	1.5	1.4	1.5	1.4	5.5	9.3	13	3.8	2.9	2
16	2.4	2.2	1.4	1.3	1.5	1.4	7.3	9.2	14	3.7	3	1.9
17	2.5	2.2	1.5	1.4	1.5	1.6	7.7	13	14	3.5	3	1.9
18	2.4	2.3	1.4	1.4	1.5	1.9	6.7	17	14	3.5	2.8	1.9
19	2.4	2.2	1.4	1.4	1.5	1.8	6.5	14	13	3.5	3.1	1.8
20	2.3	2.1	1.4	1.5	1.5	1.7	7.5	16	12	3.5	3.2	1.9
21	2.4	2.1	1.3	1.4	1.6	1.9	8.7	26	11	3.8	2.8	2
22	2.6	2	1.4	1.5	1.6	1.8	9.4	29	9.6	3.9	2.6	2.4
23	2.7	2	1.4	1.6	1.7	1.8	8.7	38	8.6	3.8	2.7	3.4
24	2.6	2.5	1.4	1.6	1.7	1.8	7.4	33	8.4	3.6	2.6	2.6
25	2.6	2.3	1.4	1.5	1.7	1.8	6.3	23	8	3.5	2.5	2.4
26	2.5	2.3	1.4	1.5	1.7	1.8	5.7	27	7.8	3.4	2.4	2.4
27	2.5	2.1	1.4	1.5	1.7	1.8	5.5	49	7.1	3.1	2.3	2.3
28	2.5	2.1	1.4	1.5	1.7	1.7	5.9	69	6.4	3.8	2.3	2.2
29	2.9	2.1	1.5	1.5	---	1.8	6	67	6.2	3.5	2.4	2.2
30	2.7	1.9	1.4	1.5	---	2	5.6	53	5.8	3.4	2.7	2.2
31	2.6	---	1.4	1.5	---	2.3	---	42	---	4.1	2.5	---
TOTAL	78.2	70.1	49.5	44.6	43.2	52.3	149.1	658.0	623.9	127.5	98.1	66.5
MEAN	2.52	2.34	1.6	1.44	1.54	1.69	4.97	21.2	20.8	4.11	3.16	2.22
AC-FT	155	139	98	88	86	104	296	1310	1240	253	195	132
MAX	2.9	2.7	2	1.6	1.7	2.3	9.4	69	51	5.5	4.5	3.4
MIN	2.3	1.9	1.3	1.3	1.4	1.4	1.9	4.4	5.8	3.1	2.3	1.8

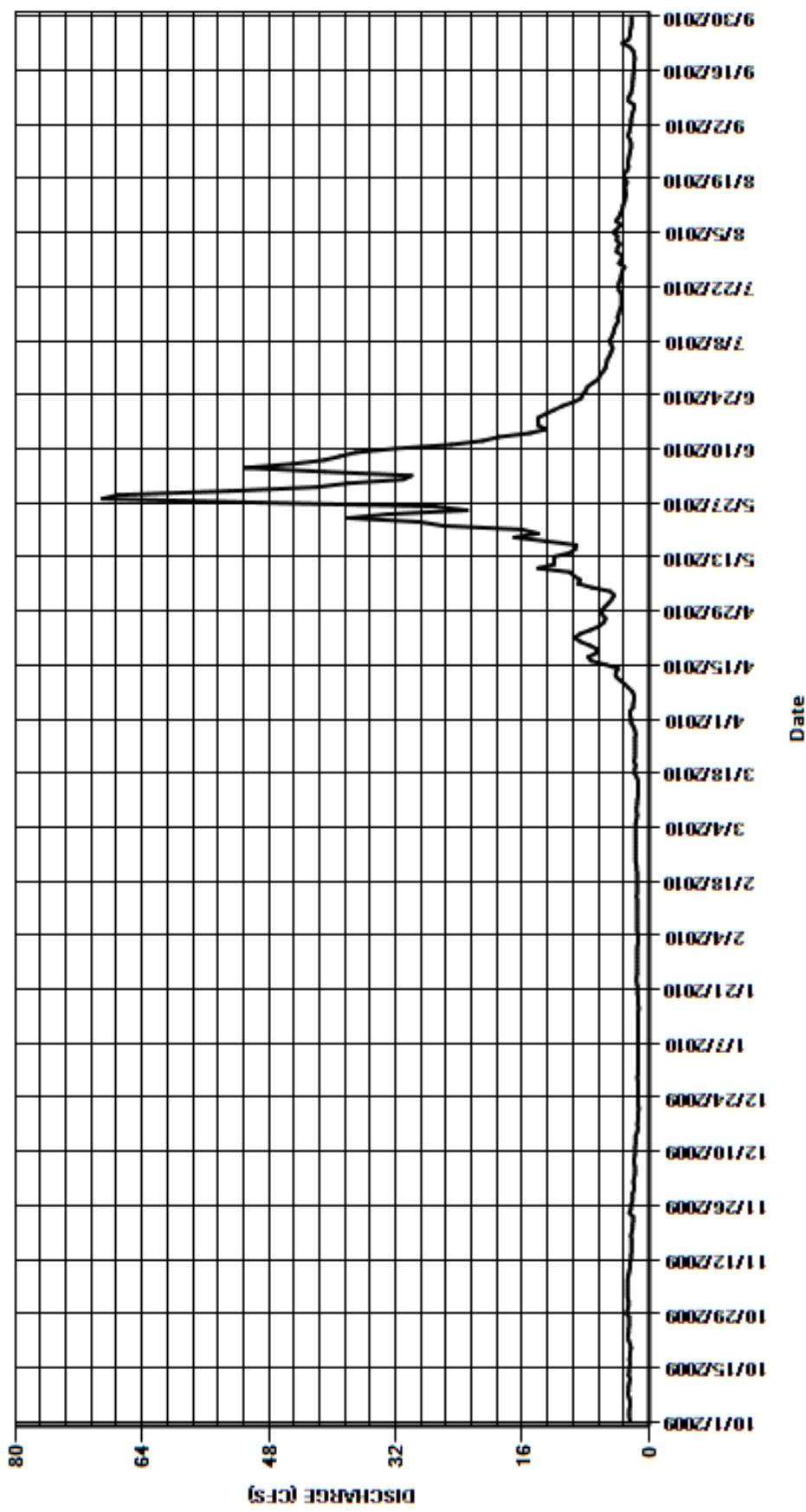
CAL YR	2009	TOTAL	2479.6	MEAN	6.79	MAX	38	MIN	1.3	AC-FT	4920
WTR YR	2010	TOTAL	2061.0	MEAN	5.65	MAX	69	MIN	1.3	AC-FT	4090

MAX DISCH: 108 CFS AT 19:45 ON May. 28,2010 GH 4.66 FT. SHIFT 0.08 FT.

MAX GH: 4.66 FT. AT 19:45 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAN ISABEL CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227000 SAGUACHE CREEK NEAR SAGUACHE
Water Year 2010

Location.-- Lat. 38°09'48", Long. 106°17'24", UTM X 386939.7, Y 4224724.1, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 45 N., R 6 E., Saguache County, Hydrologic Unit 13010004, on left bank 0.2 Mi downstream from Middle Creek and 10 mi northwest of Saguache.

Drainage and Period of Record.-- 595 mi². Aug. 1910-Sept. 1912, Jun. 1914 to current year. Monthly discharge only for some periods. Water-quality data available, Apr. 1993-Sep. 1995.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, a tipping-bucket rain gauge, and air temperature sensor in a CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Bank-operated cableway located 10 feet below gaging station. No changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the stage-discharge relation was affected by ice Nov. 21, 22, 24, 25, Dec. 5, 2008 through Mar. 8, 2009, and Mar. 10, 2009. There was one -0.01 ft instrumentation correction on June 29, 2010 made to the shaft encoder. This correction was prorated by time from previous visit.

Datum Corrections.-- Levels were not run at this gage this year. Levels were last run to the Reference Point (RP) inside the gage on Aug. 5, 2009 using R.M. No. 2 as base. The RP was within allowable limits, so no corrections were required or made.

Rating.-- Channel and gravel bar downstream are the low water controls. A bend in the channel approximately 100 feet downstream is the high water control. Scour, fill, and moss growth cause shifting. Rating No. 16 in use since Oct. 1, 1999 was used again this year. Evaluation of shifts is continuing to determine if a new rating is needed for the next water year. It is well defined from 10 to 500 cfs, but it is considered only fair outside that range. Seventeen measurements (Nos. 180-196) were made this year ranging in discharge from 15.5 to 229 cfs. They cover the range experienced except for the lower daily flows of Dec. 4-6, 8-11, 15, 16, 18-20, 24-31, 2009, Jan. 1-4, 8-10, 2010. The peak flow of 250 cfs occurred at 1530 on April 17, 2010 at a gage height of 2.72 feet with a shift of +0.13 feet. It exceeded high measurement No. 188 (GH=2.62), made April 12, 2010 by 0.10 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. The period from October 21 to October 31, 2009 was prorated based on an early ice event suspected of scouring the control. A variable shift curve (SAGASAGVS1001) was used from Apr. 7 through Aug. 26, 2010 to distribute shifts according to stage. During other periods, shifts were applied as defined by measurements, and were distributed by time. Measurements show shifts varied between -0.01 and +0.13 ft. All open water measurements were given full weight except for Nos. 190, 191, 192, 193, and 195 which were adjusted as much as 5 percent to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affected record was estimated on the basis of six measurements, weather records, partial record days, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08227000 SAGUACHE CREEK NEAR SAGUACHE

RATING TABLE--

SAGSAGCO16 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

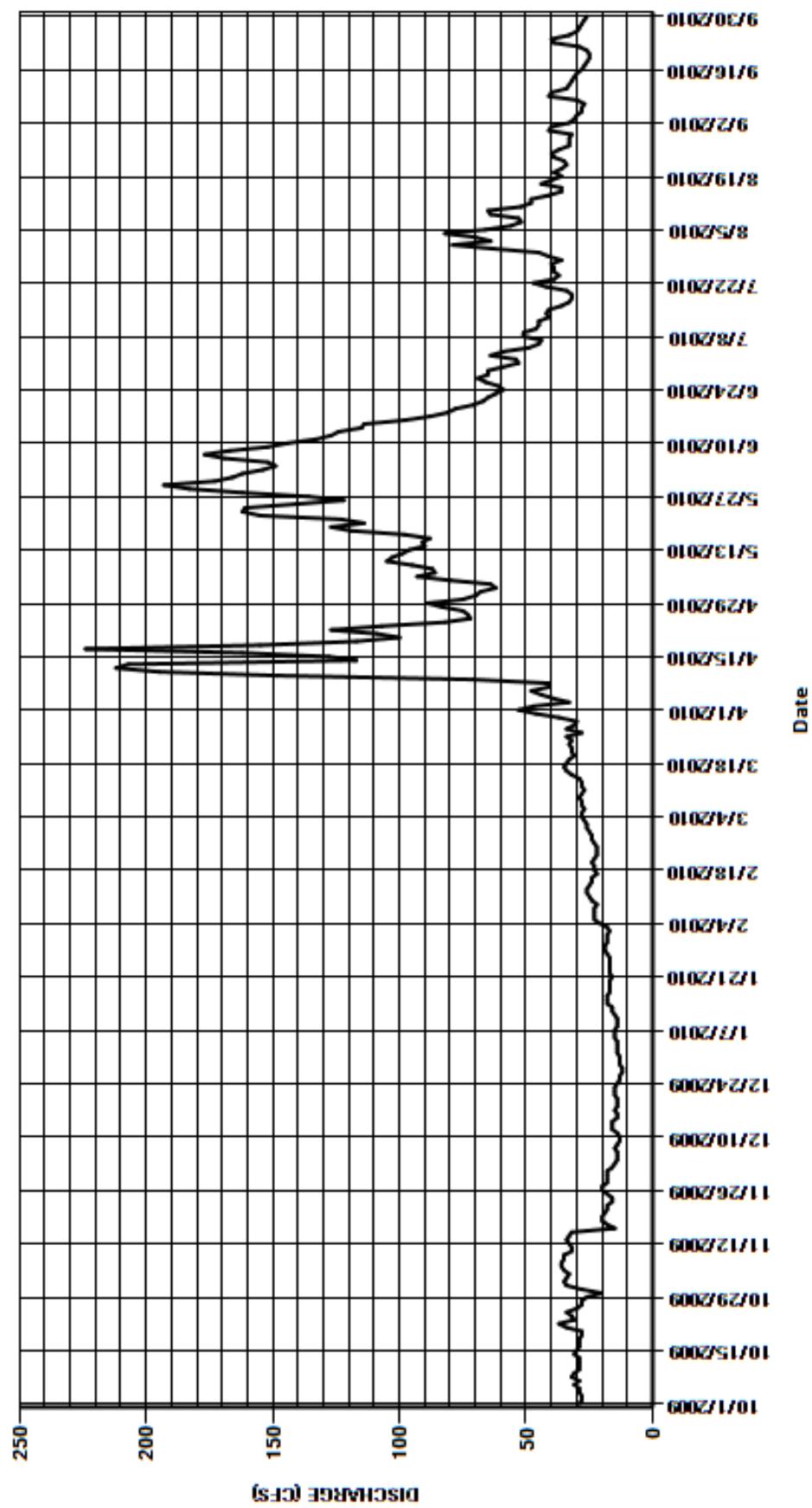
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	34	18	14	18	26	53	70	166	53	79	40
2	28	35	16	14	17	26	47	68	162	54	64	33
3	28	34	15	14	18	27	33	62	154	64	70	31
4	29	33	14	14	21	28	39	64	149	59	82	30
5	29	35	14	15	23	28	44	80	152	49	66	28
6	31	36	14	15	23	27	48	93	169	45	56	28
7	29	36	15	15	23	28	41	86	177	44	52	27
8	32	35	14	14	23	28	41	87	167	51	53	30
9	31	35	13	14	22	29	71	95	152	51	64	41
10	29	32	13	14	24	28	148	105	144	46	65	40
11	29	32	14	15	25	27	195	103	133	45	52	34
12	29	33	16	16	26	28	212	99	127	45	48	33
13	29	34	16	16	26	28	207	96	124	41	48	32
14	31	33	16	18	25	29	117	90	115	42	41	31
15	30	32	14	18	24	32	128	91	114	41	36	30
16	29	15	14	18	24	34	162	88	98	36	36	28
17	29	18	15	17	22	35	224	98	88	33	44	27
18	29	20	14	17	23	34	155	119	81	32	40	26
19	28	20	14	17	23	33	117	127	78	32	36	25
20	28	19	14	17	24	31	100	114	71	34	39	25
21	34	18	15	16	23	32	109	123	67	42	36	26
22	37	18	15	17	22	32	127	155	65	47	34	29
23	31	16	15	17	22	33	107	162	62	39	35	39
24	32	16	14	17	22	32	82	161	59	37	39	40
25	34	18	13	17	23	34	72	141	61	39	40	33
26	30	20	13	17	24	28	73	122	66	39	37	30
27	28	20	12	18	24	34	75	136	69	40	33	29
28	28	18	12	19	25	31	83	162	65	36	33	28
29	26	18	13	19	---	30	89	183	65	41	33	27
30	20	18	13	18	---	37	75	193	59	45	32	26
31	28	---	13	18	---	46	---	173	---	63	41	---
TOTAL	914	781	441	505	639	955	3074	3546	3259	1365	1464	926
MEAN	29.5	26	14.2	16.3	22.8	30.8	102	114	109	44	47.2	30.9
AC-FT	1810	1550	875	1000	1270	1890	6100	7030	6460	2710	2900	1840
MAX	37	36	18	19	26	46	224	193	177	64	82	41
MIN	20	15	12	14	17	26	33	62	59	32	32	25
CAL YR	2009	TOTAL	19762	MEAN	54.1	MAX	241	MIN	12	AC-FT	39200	
WTR YR	2010	TOTAL	17869	MEAN	49	MAX	224	MIN	12	AC-FT	35440	

MAX DISCH: 250 CFS AT 15:30 ON Apr. 17,2010 GH 2.72 FT. SHIFT 0.13 FT.

MAX GH: 2.72 FT. AT 15:30 ON Apr. 17,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227000 SAGUACHE CREEK NEAR SAGUACHE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
Water Year 2010

Location.-- Lat. 38°00'49", Long. 105°41'32", UTM X 439185.9, Y 4207551.5, Saguache County, Hydrologic Unit 13010003, on right bank in canyon, 1.5 mi. northeast of Crestone, and 3.2 mi. upstream from South Crestone Creek.

Drainage and Period of Record.-- 10.7 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 36 inch corrugated metal shelter and 36 inch concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. An In-Situ Level Troll pressure transducer was installed in the gage-pool from November 10, 2009 to August 10, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Secondary record is hourly averages of 15-minute logged submersible pressure transducer data used for winter record. Record is complete and reliable, except the stage-discharge relationship was affected by ice Nov. 16, 2009 through March 29, 2010 and Apr. 2, 3, 2010. A -0.02 ft. instrument correction was applied to all the pressure transducer data as determined by comparison with the shaft encoder before and after ice. Two instrument corrections were made to the shaft encoder, +0.01 ft on June 29, 2010 and -0.01 ft. on July 21, 2010. The corrections were prorated back to the previous visit.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #7 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a concrete ramp flume approximately 4 feet below the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. Rating No. 11 was used again this year. This rating, previously named No. 11TMP, has been in use since Apr. 27, 2005. It is well defined from 2 to 95 cfs. Seventeen measurements (Nos. 197-213) were made this year ranging in discharge from 1.34 to 65.8 cfs. They cover the discharge range experienced except for the higher daily flows on May 27-31 and June 4-8, 2010 and the lower daily flows on January 8-11, 16-19, and February 1, 2010. The peak flow of 1924 cfs occurred at 2115 on May 28, 2010 at a gage height of 2.31 feet with a shift of 0.09 feet from chart record. It exceeded high measurement No. 207 (GH = 1.621 ft.), made June 1, 2010 by 0.70 feet in stage.

Discharge.-- Shifting control method was used to compute the record as defined by measurement shifts using the pressure transducer as the primary record from November 17, 2009 through April 7, 2010 and the shaft encoder the remainder of the year. Open-water measurement shifts ranged from -0.02 ft to +0.09 ft. All measurements were given full weight except for measurements 205, 206, 210, 211, and 212 which were adjusted as much as 8 percent to smooth the shift trend.

Special Computations.-- Discharge for periods of ice effect was estimated based on application of measured shifts to pressure transducer gage-height data and adjusting discharge accordingly. Measurements during 100% ice cover were used directly to compute the discharge.

Remarks.-- Record is good except for periods of ice effect, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE

RATING TABLE--

NOCRESCO11 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	3.4	2.2	1.3	1.2	1.6	2.3	8.7	67	12	5.1	2.8
2	2.8	3.4	2.1	1.3	1.3	1.6	2.2	8.1	60	12	5.1	2.5
3	2.8	3.3	1.9	1.3	1.3	1.6	2.2	7.5	57	12	8.9	2.5
4	2.9	3.4	1.7	1.3	1.3	1.6	2.1	8.4	71	11	8.3	2.4
5	2.8	3.5	1.8	1.3	1.3	1.6	2.1	13	88	10	8.7	2.2
6	2.7	3.6	1.9	1.3	1.3	1.5	2	17	81	9.5	8.2	2.1
7	2.8	3.6	2	1.3	1.3	1.4	1.9	15	67	9.4	7.1	2.2
8	3.2	3.6	1.9	1.2	1.3	1.5	1.9	17	67	9.5	8.3	3.2
9	3.1	3.4	1.8	1.2	1.3	1.5	2.4	20	62	9.1	8.2	3.5
10	3.1	3.3	1.6	1.2	1.4	1.4	3.4	25	57	8.3	7.4	3
11	3	3.3	1.6	1.2	1.4	1.4	4.8	22	49	8.1	6.5	2.8
12	2.9	3.3	1.7	1.3	1.4	1.3	6.5	22	40	7.8	5.9	2.7
13	3.2	3.2	1.8	1.3	1.4	1.3	6.2	22	34	7.1	5.3	2.7
14	3.1	3.2	1.8	1.3	1.4	1.3	5.8	18	29	6.7	4.7	2.7
15	3.1	3.1	1.7	1.3	1.3	1.3	9.6	17	26	6.3	4.4	2.6
16	3	2.5	1.5	1.2	1.3	1.3	13	16	27	5.8	4.6	2.5
17	3	2.9	1.6	1.2	1.4	1.5	13	23	26	5.4	4.6	2.4
18	2.9	2.9	1.5	1.2	1.4	1.6	11	29	26	5.1	3.9	2.4
19	2.9	3.1	1.4	1.2	1.4	1.6	11	26	25	4.9	3.9	2.3
20	2.9	3.1	1.4	1.3	1.4	1.5	12	31	24	4.7	4.4	2.4
21	2.9	2.9	1.4	1.3	1.5	1.7	15	43	22	4.9	3.7	2.6
22	3.4	2.6	1.4	1.3	1.5	1.7	18	54	20	4.9	3.5	3.3
23	3.5	2.5	1.4	1.4	1.5	1.7	16	65	18	4.7	3.5	5.9
24	3.4	2.4	1.4	1.4	1.5	1.6	13	58	18	4.4	3.4	5.5
25	3.3	2.3	1.4	1.3	1.6	1.6	11	46	17	4	3.1	5.4
26	3	2.4	1.3	1.3	1.6	1.7	9.9	50	17	3.8	2.9	5
27	3.1	2.4	1.3	1.3	1.6	1.6	9.7	83	16	3.7	2.8	4.8
28	3.1	2.3	1.3	1.3	1.6	1.6	11	116	15	4.5	2.7	4.5
29	2.8	2.4	1.3	1.3	---	1.7	11	132	14	4.6	2.8	4.2
30	3.1	2.2	1.3	1.3	---	2	9.6	98	13	4.6	3.4	4.1
31	3.2	---	1.3	1.3	---	2.4	---	74	---	5.1	3.2	---
TOTAL	93.9	89.5	49.7	39.7	39.2	48.7	239.6	1184.7	1153	213.9	158.5	97.2
MEAN	3.03	2.98	1.6	1.28	1.4	1.57	7.99	38.2	38.4	6.9	5.11	3.24
AC-FT	186	178	99	79	78	97	475	2350	2290	424	314	193
MAX	3.5	3.6	2.2	1.4	1.6	2.4	18	132	88	12	8.9	5.9
MIN	2.7	2.2	1.3	1.2	1.2	1.3	1.9	7.5	13	3.7	2.7	2.1

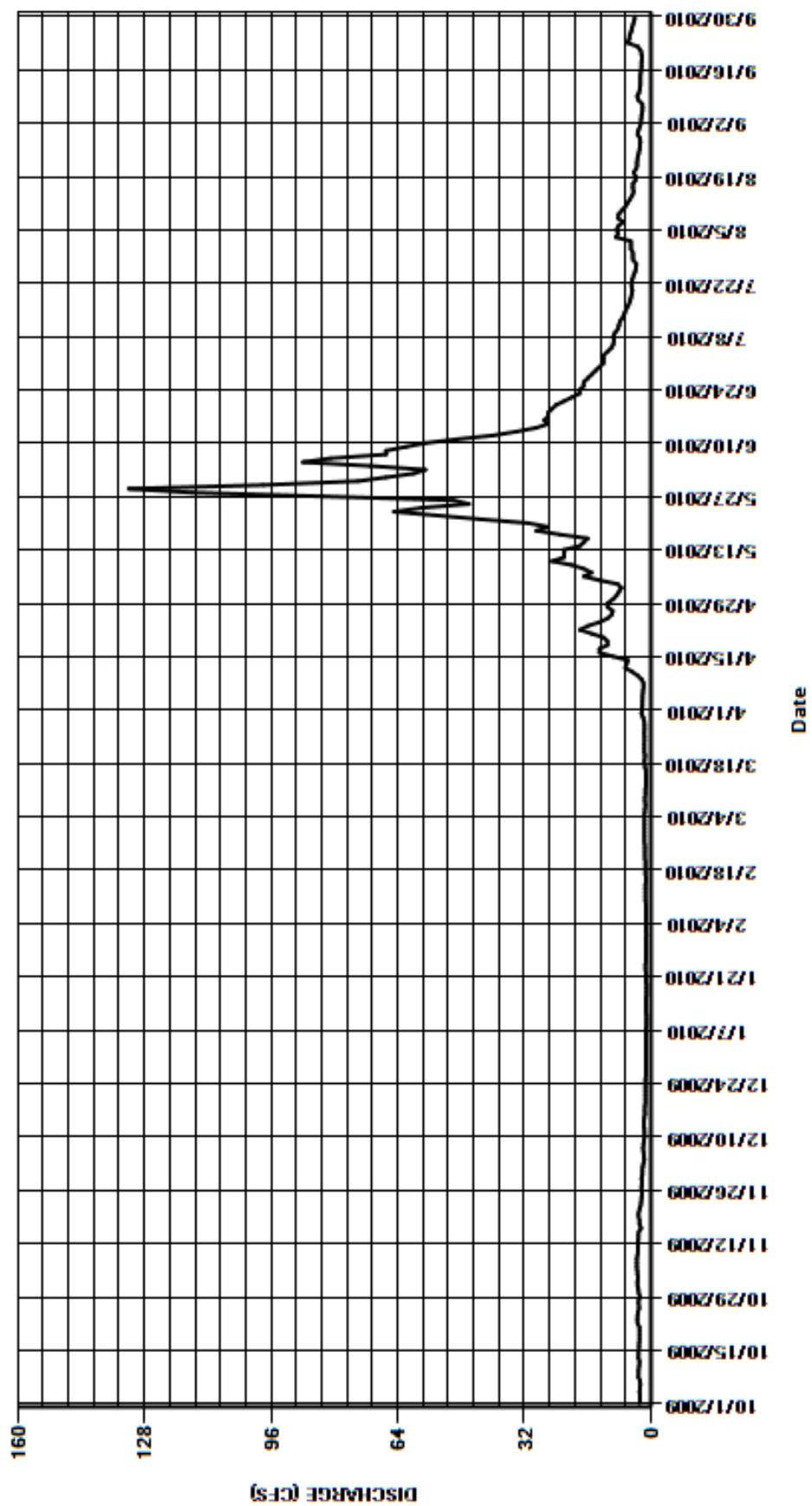
CAL YR	2009	TOTAL	4158.3	MEAN	11.4	MAX	78	MIN	1.2	AC-FT	8250
WTR YR	2010	TOTAL	3407.6	MEAN	9.34	MAX	132	MIN	1.2	AC-FT	6760

MAX DISCH: 194 CFS AT 21:15 ON May. 28,2010 GH 2.31 FT. SHIFT 0.09 FT.

MAX GH: 2.31 FT. AT 21:15 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CRESTONE CREEK NEAR CRESTONE
Water Year 2010

Location.--	Lat. 37°58'55", Long. 105°42'41", UTM X 437475.8, Y 4204050.9, in NE1/4SW1/4 Sec. 12, T.43 N., R.11 E., NMPM, Saguache Co., on right bank, 1 mile SE of Crestone.
Drainage and Period of Record.--	4.6 mi ² .
Equipment.--	Data collection platform (Sutron SatLink2 with HDR GOES radio), and a float-operated SDR in a 2 ft. diameter corrugated culvert pipe stilling well with small steel shelter on top. A 1-inch intake pipe attaches well to a 2.5 foot Parshall flume at the REW. Intake was upgraded to a 2-inch pipe in July 2010. The primary reference gage is a staff gage also located at REW. No other changes.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages from fifteen minute DCP transmitted data with DCP and SDR logs as backup. Record is complete and reliable except for Dec. 4, 2009 – Apr. 9, 2010 while station was closed for winter; Nov. 16, 22, 24, 26, 27, 2009, Apr. 10, 2010 while gage was isolated; Jul. 29-30, 2010, when no gage height data was collected due to intake being replaced; and August 10, 11, 2010 when DCP was off. The stage-discharge relation was affected by ice Oct. 30, Nov. 17-21, 23, 25, 28-30, Dec. 1-3, 2009. There was one -0.20 ft. shaft encoder correction on Apr. 30, 2010. This correction was due to no water at gage when station was opened on Apr. 9 and was applied straight back to that time.
Datum Corrections.--	Parshall flume inspection was completed on the flume on Aug. 5, 2008. Levels indicate that the lateral slope of the flume floor at the staff gage is approximately 0.4% from REW, but is slightly concave with the middle being about 0.04 feet lower than at staff. Laterally, at the throat section, the flume is level. Inspection included measurement of all pertinent Parshall Flume dimensions. A partial flume inspection was performed on Jul. 30, 2010 after the intakes were replaced. This partial inspection showed the flume to be fairly level.
Rating.--	Control is a 2.5 foot Parshall flume in good condition. The flume and well ice up during winter, and sediment deposition in and above flume can cause minor shifting. Before Jul. 29, 2010, when the inlet was replaced, the well isolated from flume at a gage-height of 0.04 to 0.06 feet. Intakes should isolate at a lower gage height after replacement, but this value has not yet been determined. Rating No. 1, a standard 2.5 foot Parshall flume rating, was used all year. Fifteen measurements (Nos. 169-183) were made this year ranging in discharge from 0 to 6.64 cfs. They cover the discharge range experienced except for higher daily flows on May 28 - Jun. 1 and Jun. 5-10. The peak flow of 15.1 cfs occurred at 0215 on May 29, 2010 at a gage height of 1.32 feet with a shift of -0.02 feet. It exceeded high measurement No. 179 (GH = 0.83 ft.) by 0.49 feet in stage.
Discharge.--	Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed mostly by time with some events considered. Open water measurements show shifts varied from -0.06 to +0.02 ft. All were given full weight except for No. 169, which was rated poor, was adjusted by 10% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using five measurements, comparison with nearby stations, surrounding good record, and weather records. A hydrograph was used for winter estimation.
Remarks.--	Record is good except for periods of no gage-height and ice affected record, which are poor. During the period when the gage was closed, there was no flow from Dec. 4, 2009 through Apr. 9, 2010 (125 days) and Aug. 27-29, Sep. 1-8, 10-21 (23 days). The timing of flow stopping and starting was estimated. Station maintained by Div 3 hydrographic staff and record developed by Andrea Tailliacq.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CRESTONE CREEK NEAR CRESTONE

RATING TABLE--

SOUCRECO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.2	0.36	0.1	0	0	0	0	0.82	6.7	0.8	0.49	0
2	0.24	0.34	0.1	0	0	0	0	0.73	5.5	0.75	0.37	0
3	0.26	0.32	0.1	0	0	0	0	0.63	4.5	0.79	0.67	0
4	0.23	0.31	0	0	0	0	0	0.66	5.7	0.76	0.79	0
5	0.22	0.31	0	0	0	0	0	1	9.3	0.73	1.4	0
6	0.19	0.31	0	0	0	0	0	1.8	9.7	0.65	1.3	0
7	0.25	0.31	0	0	0	0	0	1.5	7.3	0.64	1	0
8	0.31	0.3	0	0	0	0	0	1.8	8.4	0.65	1.2	0
9	0.29	0.28	0	0	0	0	0	1.8	7.7	0.64	1.3	0.05
10	0.28	0.27	0	0	0	0	0.01	2.5	7.5	0.59	1.3	0
11	0.26	0.28	0	0	0	0	0.2	2.2	5.8	0.58	1	0
12	0.23	0.27	0	0	0	0	0.46	2.2	4.8	0.52	0.91	0
13	0.27	0.25	0	0	0	0	0.47	2.1	4.1	0.45	0.84	0
14	0.29	0.24	0	0	0	0	0.31	1.8	3.2	0.42	0.69	0
15	0.26	0.19	0	0	0	0	0.55	1.6	2.5	0.39	0.57	0
16	0.24	0.2	0	0	0	0	1.1	1.5	2.2	0.32	0.49	0
17	0.24	0.2	0	0	0	0	1.6	1.6	2	0.2	0.46	0
18	0.24	0.2	0	0	0	0	1.2	2.4	2	0.18	0.3	0
19	0.22	0.2	0	0	0	0	1.1	2.1	2	0.16	0.36	0
20	0.23	0.15	0	0	0	0	1.2	2.2	1.9	0.16	0.48	0
21	0.25	0.15	0	0	0	0	1.3	3.8	1.8	0.22	0.24	0
22	0.26	0.15	0	0	0	0	1.7	5	1.7	0.23	0.16	0.01
23	0.36	0.1	0	0	0	0	1.6	6.1	1.5	0.25	0.18	0.19
24	0.36	0.05	0	0	0	0	1.4	6.4	1.4	0.18	0.19	0.01
25	0.32	0.05	0	0	0	0	1.2	4.9	1.3	0.1	0.11	0.01
26	0.24	0.1	0	0	0	0	1.1	4.4	1.4	0.12	0.03	0.04
27	0.31	0.1	0	0	0	0	1.1	6.5	1.4	0.1	0	0.08
28	0.31	0.1	0	0	0	0	1.2	11	1.3	0.36	0	0.15
29	0.14	0.05	0	0	---	0	1.2	13	1.1	0.33	0	0.14
30	0.2	0.1	0	0	---	0	0.94	10	0.93	0.43	0.05	0.11
31	0.35	---	0	0	---	0	---	7.3	---	0.52	0.07	---
TOTAL	8.05	6.24	0.30	0.00	0.00	0.00	20.94	111.34	116.63	13.22	16.95	0.79
MEAN	0.26	0.21	0.01	0	0	0	0.7	3.59	3.89	0.43	0.55	0.026
AC-FT	16	12	0.6	0	0	0	42	221	231	26	34	1.6
MAX	0.36	0.36	0.1	0	0	0	1.7	13	9.7	0.8	1.4	0.19
MIN	0.14	0.05	0	0	0	0	0	0.63	0.93	0.1	0	0

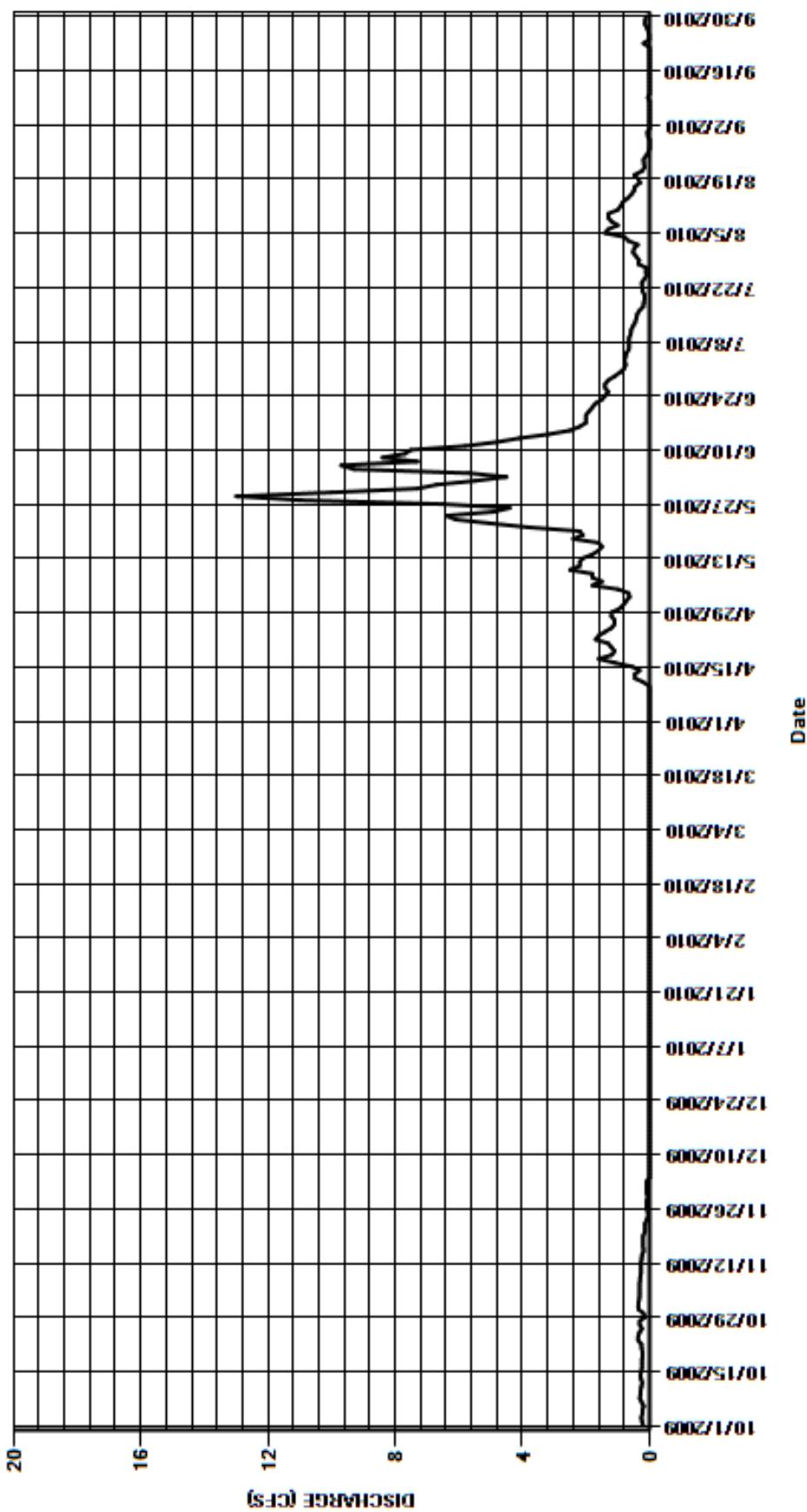
CAL YR	2009	TOTAL	535.57	MEAN	1.47	MAX	14	MIN	0	AC-FT	1060
WTR YR	2010	TOTAL	294.46	MEAN	0.81	MAX	13	MIN	0	AC-FT	584

MAX DISCH: 15.1 CFS AT 02:15 ON May. 29,2010 GH 1.32 FT. SHIFT -0.02 FT.

MAX GH: 1.32 FT. AT 02:15 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CRESTONE CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILLOW CREEK NEAR CRESTONE
Water Year 2010

Location.--	Lat. 37°57'29", Long. 105°41'59", UTM X 438481.7, Y 4201392.8, in SE1/4NW1/4 Sec. 20, T.43 N., R.12 E., NMPM, Saguache Co. on right bank, 2 miles SE of Crestone.
Drainage and Period of Record.--	8.0 mi ² .
Equipment.--	Data collection platform (Sutron SatLink Logger with HDR GOES radio), and a float-operated SDR in a 3-foot concrete pipe well and steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Gage was upgraded from 2-foot CMP well and small steel box shelter July 29, 2010.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for July 28 and 29 while gage structure was being replaced; December 4, 2009 through April 9, 2010 when the station was closed for the winter; and November 24-30, 2009 when float was frozen; and October 29-31, November 16-23 and December 1-3, 2009, when the stage-discharge relation was affected by ice. The following gage height corrections were made during the year. October 1-23, 2009: data correction from WY2009, 0.00 ft was carried to M174 where a shaft encoder correction less than 0.01 ft was noted, but not applied. June 1, 2010: a +0.04 ft. flush correction identified at M183, this was prorated back to the inflection point at 0045 on the same day. Prior to which it is assumed the correction will average over the daily diurnals so as not to bias the computed discharge record. No datum correction needed after intakes were flushed. July 29 – August 4, 2010: the shaft encoder was in reversal; this was fixed by applying a data correction with a slope of -1.0 and an offset of 5.48 to SDR log record. As determined from noted observations on July 29 and August 4, an instrument correction of -0.01 ft was applied and prorated from July 29 to August 4. August 11 – 31, 2010: a -0.01 ft shaft encoder correction was noted during M190 and prorated back to M189. Shaft encoder was reset and no datum correction was needed after M190 visit. September 20, 2010: shaft encoder was reset less than +0.01 ft prior to measurement and -0.01 ft after measurement, the sum of the corrections is less than 0.01 ft thus no correction was applied prior measurement, but -0.01 ft correction was applied during measurement. September 20 – October 14, 2010: shaft encoder correction noted during M192 visit and prorated back to last gage height observation during M191 visit. Periods not noted above had no datum correction noted or applied.
Datum Corrections.--	Levels were run this year due to the gage shelter replacement. Full levels were run July 28, 2010 and July 29, 2010. July 28, 2010 levels RP only shot once; however RP was found within tolerance by the single shot. RP and tape length was reset July 29, 2010 after gage structure was replaced. B.M. 1 was used as the base for both levels. No corrections due to levels were required or made.
Rating.--	Control is a weir made of rocks and cobbles. The PZF on the control was measured 5 times during WY2010 ranging in stage from 1.90 ft to 2.18 ft. Bankfull stage is approximately 3.10 ft. as determined by levels ran July 29, 2010. Shifting occurs due to the movement of streambed materials at control and in approach, especially at higher stages. An attempt to stabilize the control was made during the gage shelter replacement by placing boulders at the toe of the control to prevent erosion; this does not appear to have significantly affected measurement shifts. Rating No. 3-3 was used again this year. Eighteen measurements (Nos. 174-191) were made this year ranging in discharge from 0.55 to 23.8 cfs. A new rating is needed once additional high flow measurements are made. A new rating was not drawn due to uncertainty in the stage-discharge relationship at high flows due to the control rebuilding in WY2009 and changing control conditions between Msmts 183 and 184. Measurements cover the discharge range experienced except for higher daily flows on May 28-30, Jun 5-9 and lower daily flows on Mar 5-6 and 8-15. The peak flow of 35.4 cfs occurred at 0015 on Jun 6, 2010 at a gage-height of 3.38 feet with a shift of -0.07 feet. It exceeded high measurement No. 183 (gh = 3.20 ft) by 0.18 ft in stage.
Discharge.--	Shifting control method was used for all open water periods. Shifts were applied by time proration with consideration of stage and events. Open water measurements show shifts varied from -0.04 to +0.05 ft. All were given full weight except for Nos. 183 (7.23%), 185 (6.05%), 186 (9.7%), 187 (4.42%), 189 (-4.03%), and 191 (-3.57%) which were adjusted to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height was estimated using four discharge measurements, hydrographic comparison with nearby stations, and weather records.
Remarks.--	Record is good except for periods of no gage-height and ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK NEAR CRESTONE

RATING TABLE--

WILCRECO03-3 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	1.4	1	0.75	0.67	0.58	0.8	2.3	17	5.2	3.7	2.2
2	1.9	1.3	0.85	0.74	0.67	0.57	0.7	2.2	16	5.4	3.7	2.1
3	1.7	1.3	0.8	0.72	0.68	0.53	0.7	2.1	14	5.8	8.7	2
4	1.7	1.2	0.72	0.7	0.7	0.55	0.7	2.1	20	5.7	8.5	1.9
5	1.7	1.2	0.74	0.75	0.71	0.47	0.7	2.1	29	5.2	8.3	1.8
6	1.7	1.3	0.73	0.73	0.71	0.5	0.61	2.7	29	4.7	8.4	1.7
7	1.7	1.4	0.7	0.72	0.69	0.55	0.61	3	27	4.4	7.5	1.6
8	1.8	1.4	0.69	0.71	0.71	0.47	0.7	2.8	28	4.6	10	1.8
9	1.8	1.4	0.63	0.72	0.71	0.47	0.62	2.9	24	4.7	9.5	2.3
10	1.7	1.4	0.65	0.75	0.72	0.48	0.79	3.5	22	4.7	7.9	2.5
11	1.6	1.3	0.7	0.75	0.7	0.47	1	3.7	16	4.7	6.4	2.5
12	1.5	1.3	0.72	0.75	0.72	0.53	1.4	3.6	14	4.7	5.5	2.4
13	1.6	1.3	0.75	0.75	0.73	0.53	1.7	3.7	11	4.4	4.7	2.3
14	1.5	1.4	0.69	0.75	0.69	0.5	1.6	3.6	8.6	4.2	4	2.1
15	1.5	1.4	0.69	0.75	0.68	0.5	1.7	3.5	6.9	4	3.5	1.9
16	1.4	1.4	0.75	0.78	0.7	0.6	2.3	3.3	6.9	3.9	3.4	1.8
17	1.4	1.4	0.77	0.77	0.73	0.6	2.9	3.3	7.5	3.6	3.4	1.7
18	1.3	1.4	0.7	0.75	0.73	0.6	2.9	4.4	7.5	3.5	3	1.6
19	1.2	1.4	0.7	0.65	0.75	0.55	2.7	4.8	7.5	3.4	2.9	1.5
20	1.2	1.4	0.75	0.7	0.75	0.55	2.8	4.6	7.4	3.3	3.5	1.5
21	1.4	1.5	0.75	0.7	0.73	0.6	3	6.5	7.3	3.3	3.5	1.4
22	1.3	1.3	0.72	0.75	0.7	0.67	3.2	8.1	7	3.3	3.2	1.6
23	1.5	1.2	0.72	0.7	0.65	0.6	3.2	10	6.3	3.4	3	3.2
24	1.6	1.1	0.68	0.65	0.55	0.55	3.1	10	6.3	3.1	2.9	4.6
25	1.5	1.1	0.67	0.68	0.55	0.65	3	7.8	6.9	3	2.7	4.7
26	1.3	1.1	0.68	0.69	0.65	0.65	2.9	7.5	7.3	2.9	2.5	4.4
27	1.3	1.1	0.69	0.7	0.6	0.65	2.8	14	7	2.8	2.4	4
28	1.3	1.1	0.71	0.65	0.6	0.67	2.6	23	6.4	2.8	2.3	3.6
29	1.3	1	0.72	0.68	---	0.7	2.6	25	5.9	4.5	2.1	3.3
30	1.3	1	0.7	0.65	---	0.8	2.5	21	5.5	4.4	2.2	3
31	1.3	---	0.71	0.65	---	0.8	---	17	---	4	2.3	---
TOTAL	46.9	38.5	22.48	22.19	19.18	17.94	56.83	214.1	385.2	127.6	145.6	73.0
MEAN	1.51	1.28	0.73	0.72	0.68	0.58	1.89	6.91	12.8	4.12	4.7	2.43
AC-FT	93	76	45	44	38	36	113	425	764	253	289	145
MAX	1.9	1.5	1	0.78	0.75	0.8	3.2	25	29	5.8	10	4.7
MIN	1.2	1	0.63	0.65	0.55	0.47	0.61	2.1	5.5	2.8	2.1	1.4

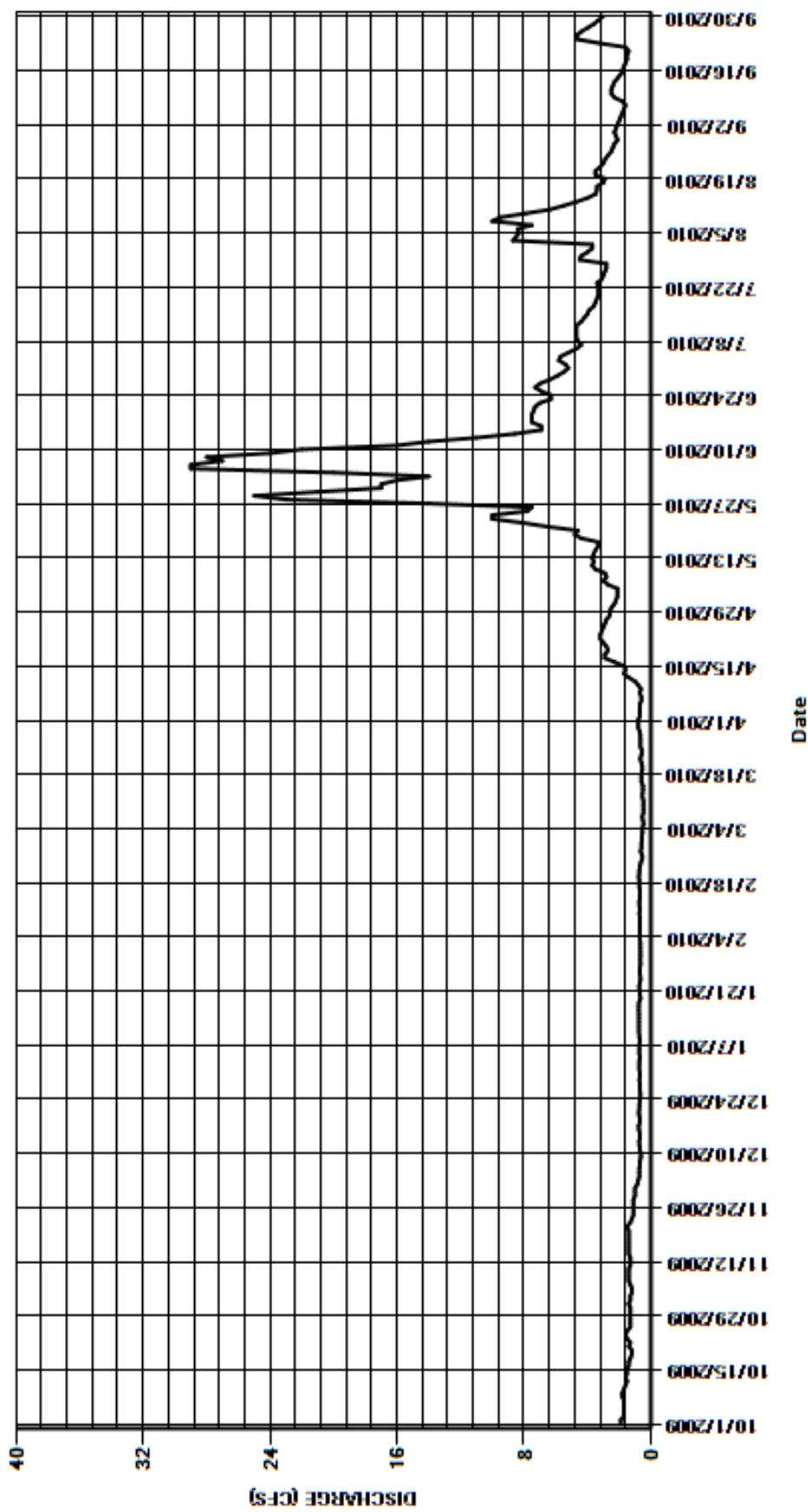
CAL YR	2009	TOTAL	1755.51	MEAN	4.81	MAX	90	MIN	0.58	AC-FT	3480
WTR YR	2010	TOTAL	1169.52	MEAN	3.2	MAX	29	MIN	0.47	AC-FT	2320

MAX DISCH: 35.4 CFS AT 00:15 ON Jun. 06,2010 GH 3.38 FT. SHIFT -0.07 FT.

MAX GH: 3.38 FT. AT 00:15 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
SPANISH CREEK NEAR CRESTONE
Water Year 2010

Location.-- Lat. $37^{\circ}57'10''$, Long. $105^{\circ}39'42''$, UTM X 441819.7, Y 4200781.8, in NE1/4SW1/4 Sec. 21, T.43 N., R.12 E., NMPM, Saguache Co., on left bank, 3 ½ miles SE of Crestone.

Drainage and Period of Record.-- 2.4 mi².

Equipment.-- Data collection platform (Sutron SatLink Logger with HDR GOES radio), and a float-operated SDR in a 2-foot culvert pipe well and small steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and SDR log as backups. Record is complete and reliable except for Dec. 4, 2009 through Apr. 9, 2010 when the station was closed for the winter and Nov. 24 through Dec. 3, 2009 when float was affected by ice in well.

Datum Corrections.-- Levels were not run to the Reference Point (RP) inside the gage this year due to the stability of elevations. Levels were last run on August 5, 2008 using B.M. 1 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made.

Rating.-- The control is a rock weir approximately 3 feet below the gage. On July 7, 2009 the rock weir was discovered to be damaged. On July 30, 2009 the rock weir was repaired and the end of WY 2009 silting in of the newly built control was observed by shift curves showing filling over time. It was also noted that rating 4-3 did not accurately reflect the shifting that had occurred at the upper end of the rating. Rating 5 was developed to fix the issue at the upper end and modify the lower end to reflect the changes in the control. This site is flashy, therefore peak flow measurements are difficult to obtain. High flow measurements since 2002 have all been less than 11.9 cfs. The highest measurement in the record, 18.1 cfs was measured on 5/20/2001. Sometime after this measurement occurred the gage pool shifted, but rating 4 did not reflect this shifting. Rating 5.0 was developed using measurements from WY2010 only because of the damage occurring in 2009 at the low end and shifting observed over time at the upper end. The pzf of 2.61 ft. was measured 7/21/2010, and was used as the offset for the entire rating curve. Measurements 176 and 177 (the two high flow measurements for WY2010) differed so an average between the two measurements was used to define the upper end. The upper end of rating 5 is 3.88 ft and computes a discharge of 41.9 cfs, whereas rating 4-3 computes a discharge of 64.7 ft³/s (54% more water). Flows greater than 10 cfs are considered poor due to the lack of measurements to define this portion of the rating. Sixteen measurements (Nos. 167-182) were made this year ranging in discharge from 0.40 to 10.2 cfs. They cover the discharge range experienced except for higher daily flows on May 22-24, 27-31, Jun. 1, and 4-9. The peak flow of 34.4 cfs occurred at 2130 on May 28, 2010 at a gage height of 3.82 ft. with a shift of -0.01 ft. It exceeded high measurement No. 177 made on June 7, 2010 (GH=3.48 ft.) by 0.34 ft. in stage.

Discharge.-- One variable shift curve was used during high water from April 9 through June 7, 2010 and shifting control method was used during remaining open water periods. Open water measurements show shifts varied from -0.02 to +0.05 ft. All were given full weight except for Nos. 176 and 177 which were adjusted +7% and -6% respectively to smooth shift distribution.

Special Computations.-- Discharge for period of no gage-height and ice affected record was estimated using discharge measurements and weather records. A hydrograph was used.

Remarks.-- Record is fair except for periods of no gage-height and ice affected record and flows over 10 cfs, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SPANISH CREEK NEAR CRESTONE

RATING TABLE--

SPACRECO05 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

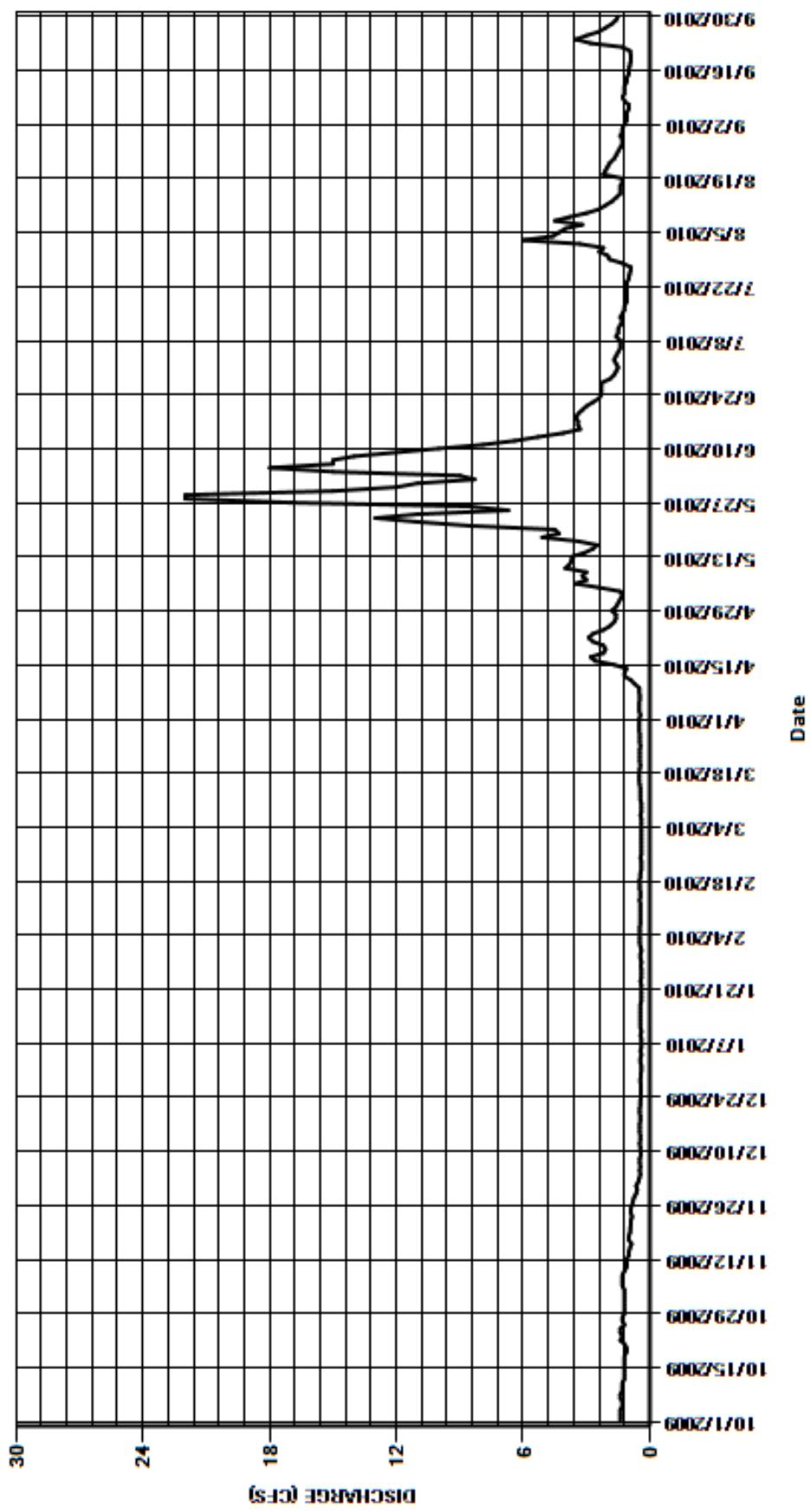
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	1.2	0.65	0.4	0.45	0.4	0.5	1.5	11	1.5	2.2	1.3
2	1.4	1.2	0.55	0.45	0.48	0.4	0.45	1.4	8.3	1.6	3.3	1.2
3	1.4	1.2	0.5	0.45	0.48	0.4	0.5	1.3	9	1.7	6	1.1
4	1.4	1.2	0.45	0.4	0.48	0.4	0.5	1.4	15	1.6	4.6	1.1
5	1.3	1.3	0.48	0.45	0.48	0.4	0.5	2.4	18	1.5	4.3	1.1
6	1.3	1.3	0.45	0.4	0.48	0.4	0.48	3.5	15	1.4	4	1
7	1.4	1.3	0.48	0.4	0.45	0.45	0.48	3	15	1.4	3.2	0.99
8	1.4	1.3	0.48	0.4	0.45	0.4	0.5	3.2	14	1.4	4.5	1.2
9	1.3	1.2	0.43	0.45	0.45	0.4	0.5	3	12	1.6	3.8	1.3
10	1.3	1.1	0.45	0.4	0.45	0.4	0.72	4	10	1.5	3	1.2
11	1.3	1.1	0.45	0.45	0.45	0.45	0.89	3.8	7.9	1.5	2.4	1.2
12	1.2	1.1	0.48	0.45	0.45	0.45	1.2	3.7	6.4	1.4	2.1	1.2
13	1.2	1	0.45	0.45	0.48	0.45	1.2	3.7	5.3	1.3	1.8	1.1
14	1.2	0.99	0.45	0.45	0.45	0.45	1.1	3.1	4.1	1.4	1.6	1.1
15	1.2	0.94	0.48	0.45	0.45	0.48	1.7	2.7	3.3	1.3	1.4	1
16	1.2	0.86	0.48	0.45	0.48	0.5	2.6	2.5	3.4	1.2	1.4	1
17	1.2	1	0.48	0.45	0.48	0.5	2.8	3.4	3.4	1.2	1.4	0.96
18	1.2	0.99	0.45	0.4	0.5	0.5	2.2	5.1	3.5	1.1	1.3	0.92
19	1.1	0.94	0.45	0.4	0.45	0.48	2.1	4.3	3.4	1.1	1.3	0.89
20	1.1	0.92	0.48	0.4	0.45	0.45	2.2	4.5	3.2	1.1	2.2	0.91
21	1.2	0.91	0.48	0.4	0.4	0.48	2.7	8.5	3	1.1	2.1	0.94
22	1.4	0.9	0.45	0.4	0.4	0.48	2.9	11	2.7	1.1	2	1.3
23	1.3	0.84	0.45	0.45	0.4	0.48	2.7	13	2.4	1.1	1.9	2.8
24	1.4	0.9	0.43	0.4	0.45	0.48	2.2	11	2.3	1	1.7	3.5
25	1.4	0.9	0.43	0.4	0.4	0.45	1.9	6.7	2.3	0.97	1.6	3
26	1.2	0.85	0.43	0.4	0.4	0.48	1.7	8.5	2.3	0.92	1.5	2.4
27	1.3	0.8	0.43	0.43	0.4	0.48	1.6	17	2.3	0.9	1.4	2.1
28	1.3	0.75	0.45	0.4	0.4	0.48	1.6	22	1.9	1.3	1.3	1.8
29	1.2	0.65	0.44	0.45	---	0.5	1.8	22	1.7	1.9	1.3	1.6
30	1.2	0.6	0.43	0.45	---	0.5	1.6	15	1.6	2	1.4	1.5
31	1.2	---	0.4	0.4	---	0.5	---	12	---	2.4	1.3	---
TOTAL	39.6	30.24	14.39	13.13	12.54	14.07	43.82	208.2	193.7	42.49	73.3	42.71
MEAN	1.28	1.01	0.46	0.42	0.45	0.45	1.46	6.72	6.46	1.37	2.36	1.42
AC-FT	79	60	29	26	25	28	87	413	384	84	145	85
MAX	1.4	1.3	0.65	0.45	0.5	0.5	2.9	22	18	2.4	6	3.5
MIN	1.1	0.6	0.4	0.4	0.4	0.4	0.45	1.3	1.6	0.9	1.3	0.89
CAL YR	2009	TOTAL	1089.49	MEAN	2.98	MAX	56	MIN	0.35	AC-FT	2160	
WTR YR	2010	TOTAL	728.19	MEAN	2	MAX	22	MIN	0.4	AC-FT	1440	

MAX DISCH: 34.4 CFS AT 21:30 ON May. 28,2010 GH 3.82 FT. SHIFT -0.01 FT.

MAX GH: 3.82 FT. AT 21:30 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SPANISH CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08229500 COTTONWOOD CREEK NEAR CRESTONE
Water Year 2010

Location.-- Lat. 37°56'51", Long. 105°39'05", UTM X 443269.4, Y 4198614.6, T.43 N., R.12 E., NMPM, Saguache Co., on left bank of channel approximately 500 feet south of road, 5 miles SE of Crestone.

Drainage and Period of Record.-- 5.0 mi².

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated SDR in a 3 ft. by 3 ft. timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages from fifteen minute DCP transmitted data with DCP log and SDR log as backup. Gage-height record is complete and reliable except for Nov. 16-30, and Dec. 1-3, 2009 when the well was frozen; Dec. 4, 2009 through Apr. 9, 2010 when station was closed for the winter; and April 15-30, May 28-31, June 1, 5-7, 2010 when inlets were buried. There were no instrument corrections made to the shaft encoder or SDR. There were two +0.01 foot flush corrections made, which were prorated from previous point of inflection.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Aug. 5, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, a correction was not made.

Rating.-- The control is a cobble riffle approximately 6 feet below the gage. Shifting occurs mainly due to the movement of streambed materials and leaves building up on the control. Rating No. 5-1 was used again this water year. It is fairly well defined from 0.7 to 50 cfs. Sixteen discharge measurements (Nos. 168-183) were made during the year ranging from 0.76 to 35.2 cfs. They cover the discharge range experienced except for lower daily flows on Jan. 31 to Feb. 2, 2010 and higher daily flows of May 27-29, and June 4-7, 2010. The peak of 71.5 cfs, which was estimated by hydrographic comparison with Spanish Creek near Crestone due to an isolated well, occurred during the 2200 hour on May 28, 2010. It exceeded high measurement No. 178 (GH = 2.60), made June 7, 2010, by 36.3 cfs.

Discharge.-- Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and distributed by time. Measurements show shifts varied between -0.12 and +0.04 feet. All measurements were given full weight except Nos. 168, 177, 178, and 179 which were all fair measurements and adjusted by as much as 8% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record were estimated using six discharge measurements and weather records. Discharge for period of buried inlets was estimated using three discharge measurements, distributing the flush corrections, and using nearby gage 'Spanish Creek near Crestone' as a reference.

Remarks.-- Record is fair except for periods of estimated record which are poor. The instantaneous peak discharge should also be considered poor because it was estimated. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet and Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08229500 COTTONWOOD CREEK NEAR CRESTONE

RATING TABLE--

COCRESCO05-1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	1.9	1.4	1.4	0.7	1	1.5	2.6	30	6.1	5.4	2.3
2	2.3	1.9	1.4	1.4	0.7	0.9	1.3	2.4	25	6.2	6.5	2.2
3	2.3	2	1.3	1.5	0.8	0.9	1.4	2.3	26	6.2	9.8	2.1
4	2.3	2.1	1.2	1.5	0.9	0.9	1.5	2.7	40	5.9	8.5	2.1
5	2.2	2.1	1.3	1.4	1	1.1	1.4	4	43	5.5	8.7	2
6	2.2	2.2	1.2	1.3	1.2	1.2	1.3	5.5	40	5.2	7.4	2
7	2.4	2.2	1.3	1.3	1.2	1.2	1.3	4.8	36	5.1	6.3	1.9
8	2.5	2.2	1.3	1.4	1.2	1.2	1.3	5.2	35	5.2	7.2	2.4
9	2.3	2.1	1.2	1.4	1.1	1.3	1.3	4.8	31	5.7	6.3	2.6
10	2.3	2	1.2	1.4	1.1	1.3	1.6	6	27	5.1	5.6	2.3
11	2.3	2	1.2	1.4	1.1	1.3	1.8	5.9	22	4.8	5	2.2
12	2.1	2	1.3	1.4	1.1	1.2	2.2	6	17	4.8	4.7	2.1
13	2.2	1.9	1.3	1.5	1	1.2	2	7.4	14	4.5	4.2	2.1
14	2.1	1.9	1.2	1.5	0.9	1.2	1.8	5.5	11	4.3	3.9	2
15	2.1	1.8	1.2	1.5	0.9	1.3	2.5	4.8	9.7	4	3.6	2
16	2	1.7	1.3	1.5	0.8	1.4	3.5	4.7	11	3.9	3.5	1.9
17	2.1	1.9	1.3	1.5	0.8	1.4	3.7	7.5	11	3.6	3.4	1.9
18	1.9	1.9	1.2	1.4	0.8	1.3	3.1	11	11	3.5	3	1.8
19	1.9	1.8	1.2	1.4	0.9	1.2	2.9	8.6	10	3.4	3.1	1.8
20	1.8	1.8	1.3	1.3	1	1.1	3.1	10	9.6	3.2	3.7	1.8
21	1.8	1.8	1.3	1.2	1.1	1	3.6	18	9.1	3.3	3.2	1.8
22	2	1.8	1.2	1.1	1.2	1.2	3.8	23	8.6	3.3	3	2.8
23	2.1	1.7	1.2	1	1.2	1.3	3.6	30	7.8	3.2	3.1	5.5
24	2	1.7	1.2	0.9	1.2	1.2	3.1	24	8	3.1	2.9	5.1
25	2	1.7	1.3	0.8	1.1	1.3	2.8	16	7.9	3	2.6	4.1
26	1.7	1.6	1.3	0.8	1.1	1.3	2.6	22	7.7	2.9	2.6	3.6
27	1.9	1.6	1.4	0.9	1	1.3	2.5	39	7.3	2.8	2.5	3.2
28	1.8	1.6	1.5	0.9	1	1.3	2.6	51	6.3	3.3	2.4	2.9
29	1.7	1.4	1.5	0.8	---	1.4	2.6	51	6.2	3.4	2.4	2.5
30	1.7	1.4	1.5	0.8	---	1.5	2.6	35	6.2	7.6	2.6	2.3
31	1.7	---	1.5	0.7	---	1.6	---	33	---	7.2	2.5	---
TOTAL	63.9	55.7	40.2	38.30	28.10	38.00	70.3	453.7	534.4	139.3	139.6	75.3
MEAN	2.06	1.86	1.3	1.24	1	1.23	2.34	14.6	17.8	4.49	4.5	2.51
AC-FT	127	110	80	76	56	75	139	900	1060	276	277	149
MAX	2.5	2.2	1.5	1.5	1.2	1.6	3.8	51	43	7.6	9.8	5.5
MIN	1.7	1.4	1.2	0.7	0.7	0.9	1.3	2.3	6.2	2.8	2.4	1.8

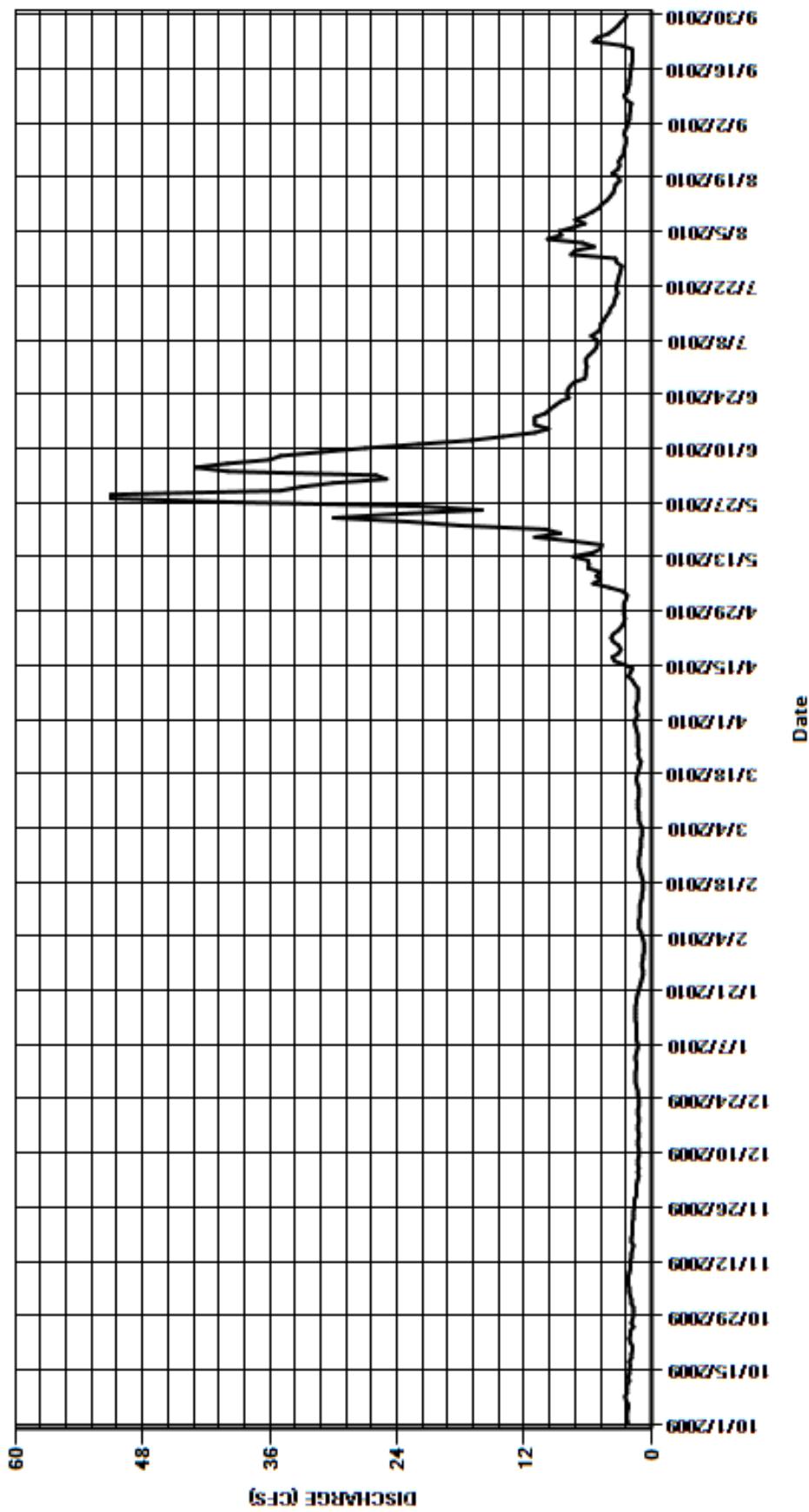
CAL YR	2009	TOTAL	2311.20	MEAN	6.33	MAX	59	MIN	0.8	AC-FT	4580
WTR YR	2010	TOTAL	1676.80	MEAN	4.59	MAX	51	MIN	0.7	AC-FT	3330

MAX DISCH: 71.5 CFS AT 22:00 ON May. 28,2010 (ESTIMATED)

MAX GH: 2.81 FT. AT 20:30 ON May. 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08229500 COTTONWOOD CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
DEADMAN CREEK NEAR CRESTONE
Water Year 2010

Location.-- Lat. $37^{\circ}53'05''$, Long. $105^{\circ}38'47''$, UTM X 443109.5, Y 4193221.7, in NE1/4, SE1/4, Sec. 3, T.42 N., R.12 E., NMPM, Saguache Co., on right bank 8 miles SE of Crestone.

Drainage and Period of Record.-- 8.4 mi².

Equipment.-- Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well. The well is connected to a non-standard 6 foot Parshall Flume in fair condition. Gage-height set from outside staff gage in the non-standard 6-foot Parshall Flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable, except for Oct. 1, 3-7, 11-13, 16-21, 23, 24, 26, 27, 29, 30, Nov. 2-11, 2009, and Apr. 10-12, Jul. 18-31, Aug. 1 -5, 9-31, Sep. 1-30, 2010 when the well isolated from flume, and Nov. 12, 2009 through Apr. 9, 2010 when the station was closed for the winter. There were three shaft encoder corrections: one of -0.47 feet on Apr. 16 from station being opened with no flow and no stage reference; another of +0.46 feet on May 26 when tape slipped from shaft encoder pins; and -0.01 feet on Jun. 29, 2010. The first correction was applied straight from when the station was opened. The second was applied straight back to the point in the hydrograph where a large fall occurred, which was assumed to be the point where the tape slipped. The third was prorated by time from previous gage reference.

Datum Corrections.-- A formal inspection with levels was not performed this year. The Parshall flume was inspected and levels were shot on Aug. 5, 2008.

Rating.-- Rating No. 1, a standard six foot Parshall flume rating, was used all year. Minor shifting occurs due to non-standard flume dimensions, approach velocity, and approach angle. Eleven discharge measurements (Nos. 46-56) were made during the water year because of limited access to the station. The measured discharges ranged from 0 to 22.8 cfs. Measurement No. 54, 1.19 cfs, was the lowest measurement made and used. Measurement No. 46, 0.05 cfs, was made but not used due to depths not being within specification of the Pygmy meter. The measurements cover the discharge range experienced except for higher daily flows on May 21 – Jun. 1, and Jun. 4–8. There was no flow at the station from Nov. 13, 2009 to April 11, 2010, July 21 – Aug 5, and Aug 9 – Sept. 23 (estimated). The peak flow of 69.7 cfs occurred at 1945 on May 28, 2010 at a gage height of 1.95 feet with a shift of 0 feet. It exceeded high measurement No. 53 (GH = 0.95), made June 7, 2010, by 1.00 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Measurement shifts ranged from -0.03 to +0.02 feet. All measurements were given full weight and applied except for Nos. 51-53, which were adjusted as much as 4%, No. 54, which was rated poor and adjusted 8%, and No. 46, which was not used due to depths being outside Pygmy meter specification.

Special Computations.-- Discharge for periods of no gage-height was estimated using six measurements, comparison with nearby stations, and weather records.

Remarks.-- Record is fair except for periods of no gage-height, including periods when the well was isolated, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN CREEK NEAR CRESTONE

RATING TABLE--

DEDCRECO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.36	0.42	0	0	0	0	0	6.2	25	1	0	0
2	0.38	0.33	0	0	0	0	0	5.5	19	1	0	0
3	0.32	0.29	0	0	0	0	0	4.8	19	1.1	0	0
4	0.3	0.28	0	0	0	0	0	5.4	27	0.91	0	0
5	0.2	0.26	0	0	0	0	0	9.1	34	0.74	0	0
6	0.25	0.24	0	0	0	0	0	12	30	0.54	0.6	0
7	0.35	0.2	0	0	0	0	0	10	25	0.44	0.35	0
8	0.52	0.17	0	0	0	0	0	12	25	0.73	0.27	0
9	0.5	0.14	0	0	0	0	0	12	21	0.8	0	0
10	0.43	0.11	0	0	0	0	0	14	19	0.66	0	0
11	0.3	0.08	0	0	0	0	0	13	15	0.48	0	0
12	0.29	0.05	0	0	0	0	1.6	13	12	0.39	0	0
13	0.45	0	0	0	0	0	1.9	13	9.4	0.24	0	0
14	0.61	0	0	0	0	0	1.7	12	7.2	0.2	0	0
15	0.59	0	0	0	0	0	3	11	5.7	0.2	0	0
16	0.45	0	0	0	0	0	6.1	10	6.1	0.2	0	0
17	0.2	0	0	0	0	0	6.7	14	5.9	0.2	0	0
18	0.2	0	0	0	0	0	5.2	18	5.4	0.2	0	0
19	0.2	0	0	0	0	0	5.3	14	4.8	0.1	0	0
20	0.2	0	0	0	0	0	6.7	17	4.4	0.05	0	0
21	0.35	0	0	0	0	0	7.8	30	3.9	0	0	0
22	0.41	0	0	0	0	0	9.1	37	3.4	0	0	0
23	0.37	0	0	0	0	0	8.3	43	2.7	0	0	0
24	0.35	0	0	0	0	0	7.1	37	2.9	0	0	0.34
25	0.45	0	0	0	0	0	6.4	25	2.8	0	0	0.2
26	0.34	0	0	0	0	0	6	28	2.8	0	0	0.2
27	0.34	0	0	0	0	0	5.8	43	2.5	0	0	0.2
28	0.4	0	0	0	0	0	6.5	51	1.9	0	0	0.17
29	0.36	0	0	0	---	0	7.3	47	1.5	0	0	0.14
30	0.34	0	0	0	---	0	6.8	35	1.2	0	0	0.14
31	0.39	---	0	0	---	0	---	26	---	0	0	---
TOTAL	11.20	2.57	0.00	0.00	0.00	0.00	109.30	628.0	345.5	10.18	1.22	1.39
MEAN	0.36	0.086	0	0	0	0	3.64	20.3	11.5	0.33	0.039	0.046
AC-FT	22	5.1	0	0	0	0	217	1250	685	20	2.4	2.8
MAX	0.61	0.42	0	0	0	0	9.1	51	34	1.1	0.6	0.34
MIN	0.2	0	0	0	0	0	0	4.8	1.2	0	0	0

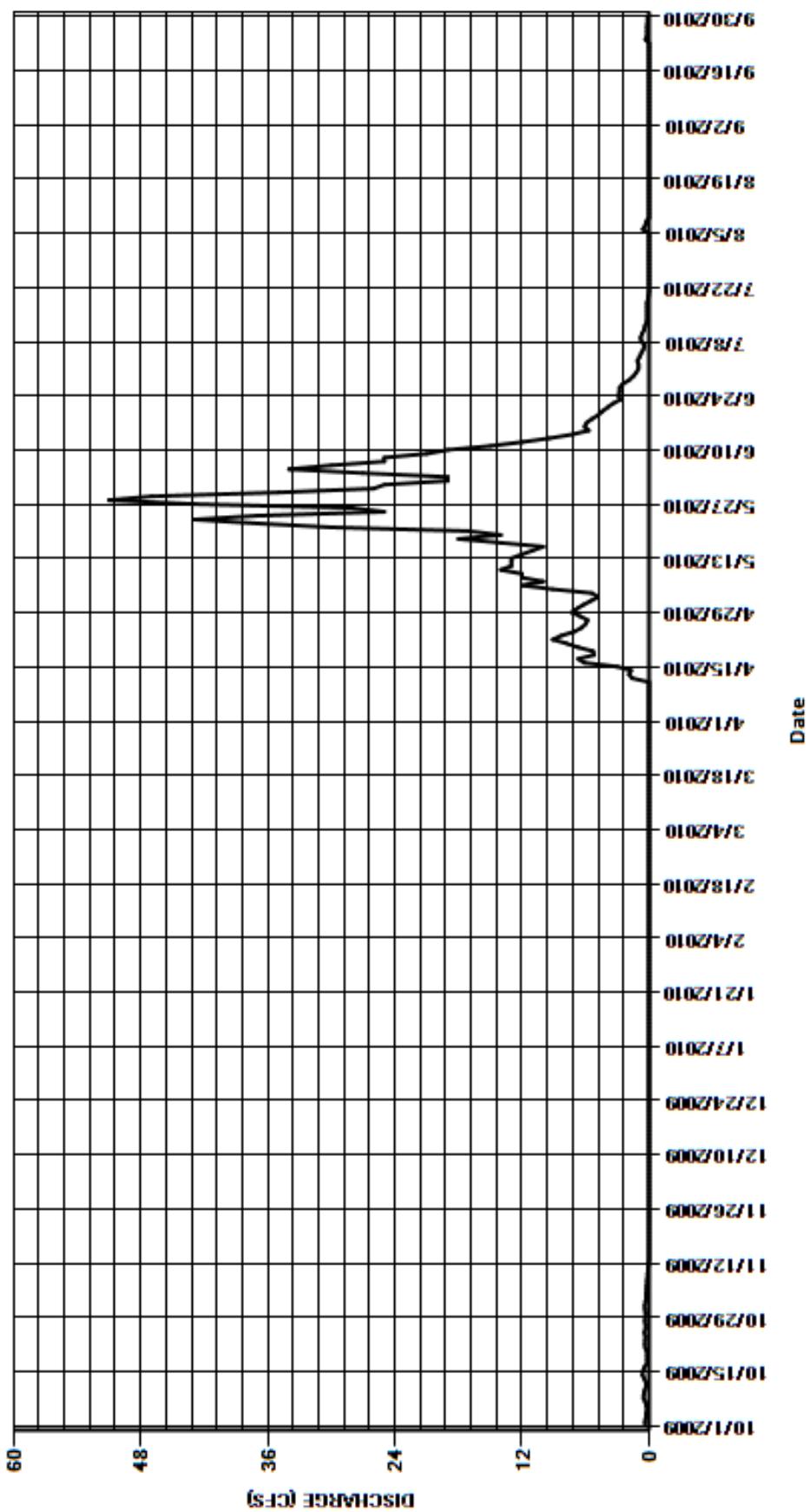
CAL YR	2009	TOTAL	2168.80	MEAN	5.94	MAX	46	MIN	0	AC-FT	4300
WTR YR	2010	TOTAL	1109.36	MEAN	3.04	MAX	51	MIN	0	AC-FT	2200

MAX DISCH: 69.7 CFS AT 19:45 ON May. 28,2010 GH 1.95 FT. SHIFT 0 FT.

MAX GH: 1.95 FT. AT 19:45 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN CREEK NEAR CRESTONE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
Water Year 2010

Location.-- Lat. $37^{\circ}42'49''$, Long. $105^{\circ}38'55''$, UTM X 442783.5, Y 4174237.4, in the NE $\frac{1}{4}$ SW $\frac{1}{4}$, sec. 15, T.40 N., R.12 E., New Mexico Principal Meridian, in Alamosa county.

Drainage and Period of Record.-- 0.2 mi². Flow primarily due to groundwater accretions. First record produced for water year 2000.

Equipment.-- Float-operated Sutron SDR with SDI-12 radio bridge in a 30 inch diameter pipe stilling well and CMP extension for gage shelter. The gage-height data is transmitted via radio bridge to data collection platform (Sutron Satlink2 Logger) at Big Spring Creek at Medano Ranch near Mosca. The primary reference gage is a staff gage in the 2-foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for Nov. 24, 2009, when the stage-discharge relation was affected by ice; Nov. 25-30, Dec. 1-9, 2009 when the well was frozen; Dec. 10, 2009 through Mar. 31, 2010 when the station was closed for the winter; and May 21-25, 2010 when the inlet was plugged. The Parshall flume was partially submerged or otherwise compromised on July 14-31, August 1, 2, and September 10-29, 2010. There were three corrections made to the shaft encoder of -0.01 ft., +0.01 ft., and -0.02 ft. on June 11, July 6, and August 2, 2010, respectively, which were prorated by time back to the previous visits. PARSHALL FLUME INSPECTION: A formal inspection with levels was not performed this year. The last Parshall flume inspection and levels were completed on July 3, 2008, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage (REW). Levels indicate that the flume floor slopes approximately 2% with the floor at the staff gage (REW) 0.076' lower than the well inlet (LEW). The flume also slopes slightly downward toward diverging section. Inspection included measurement of all pertinent Parshall Flume dimensions.

Datum Corrections.-- A formal inspection with levels was not performed this year. The last Parshall flume inspection and levels were completed on July 3, 2008, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage (REW). Levels indicate that the flume floor slopes approximately 2% with the floor at the staff gage (REW) found to be 0.076 ft lower than the well inlet (LEW). The flume also slopes slightly downward toward diverging section. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- A standard two-foot Parshall flume rating was used all year. Sand and moss build-up in approach and inside the flume requires occasional cleaning. Fourteen measurements (Nos. 113-126) were made this year ranging in discharge from 1.10 to 3.29 cfs. They cover the discharge range experienced this year except for the lower daily flows on Jul. 10, 25-29, Aug. 12-15, 22, Sep. 5-7, 10, 11, 14, 2010. The peak flow of 3.29 cfs occurred at 1325 on Dec. 10, 2009 at a gage height of 0.68 ft with a shift of -0.12 ft (ice affected).

Discharge.-- Shifting control method was used during all periods of gage-height record. Measurements show shifts varied from -0.04 ft. (flume mostly submerged) to +0.03 ft. All were given full weight except for Nos. 113, 114, and 122, which were adjusted by as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height was estimated using four discharge measurements, comparison with nearby station Big Spring Creek at Medano Ranch, and weather records. Discharge for periods when the Parshall flume was partially submerged or otherwise compromised was estimated using three measurements and questionable gage-height record.

Remarks.-- Record is good except for periods of no gage-height and periods of submerged record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Stanley J. Ditmars.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO

RATING TABLE--

STD2FTPF USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

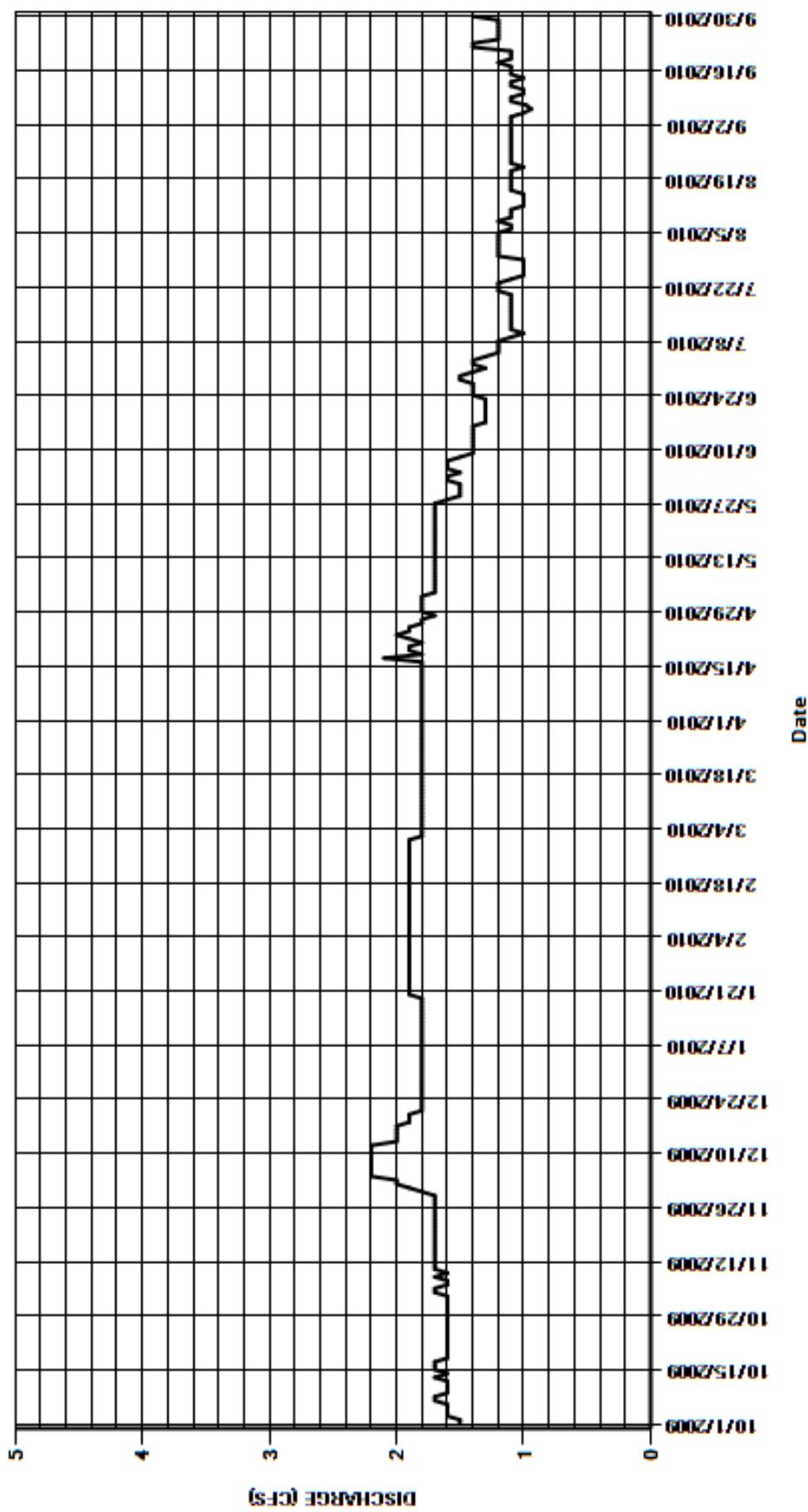
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	1.6	1.9	1.8	1.9	1.9	1.8	1.8	1.5	1.3	1.2	1.1
2	1.5	1.6	2	1.8	1.9	1.8	1.8	1.8	1.6	1.4	1.2	1.1
3	1.6	1.6	2	1.8	1.9	1.8	1.8	1.8	1.6	1.4	1.2	1.1
4	1.6	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.5	1.3	1.2	1.1
5	1.6	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.6	1.2	1.2	1
6	1.6	1.6	2.2	1.8	1.9	1.8	1.8	1.7	1.6	1.2	1.1	0.94
7	1.7	1.6	2.2	1.8	1.9	1.8	1.8	1.7	1.6	1.2	1.1	0.98
8	1.7	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.5	1.2	1.2	1.1
9	1.6	1.6	2.2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1.1	1.1
10	1.6	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.4	1	1.1	1
11	1.6	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1.1	1
12	1.6	1.7	2.2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1	1.1
13	1.7	1.7	2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1	1.1
14	1.6	1.7	2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1	1
15	1.7	1.7	2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1	1.1
16	1.7	1.7	2	1.8	1.9	1.8	1.8	1.7	1.4	1.1	1.1	1.1
17	1.7	1.7	2	1.8	1.9	1.8	2.1	1.7	1.3	1.1	1.1	1.1
18	1.6	1.7	1.9	1.8	1.9	1.8	1.8	1.7	1.3	1.1	1.1	1.2
19	1.6	1.7	1.9	1.8	1.9	1.8	1.9	1.7	1.3	1.1	1.1	1.1
20	1.6	1.7	1.9	1.9	1.9	1.8	1.9	1.7	1.3	1.1	1.1	1.1
21	1.6	1.7	1.8	1.9	1.9	1.8	1.8	1.7	1.3	1.2	1.1	1.1
22	1.6	1.7	1.8	1.9	1.9	1.8	1.9	1.7	1.3	1.2	1	1.4
23	1.6	1.7	1.8	1.9	1.9	1.8	2	1.7	1.3	1.2	1.1	1.4
24	1.6	1.7	1.8	1.9	1.9	1.8	1.9	1.7	1.4	1.1	1.1	1.2
25	1.6	1.7	1.8	1.9	1.9	1.8	1.9	1.7	1.4	1	1.1	1.2
26	1.6	1.7	1.8	1.9	1.9	1.8	1.8	1.7	1.4	1	1.1	1.2
27	1.6	1.7	1.8	1.9	1.9	1.8	1.8	1.7	1.4	1	1.1	1.2
28	1.6	1.7	1.8	1.9	1.9	1.8	1.7	1.6	1.5	1	1.1	1.2
29	1.6	1.7	1.8	1.9	---	1.8	1.8	1.5	1.5	1	1.1	1.2
30	1.6	1.8	1.8	1.9	---	1.8	1.8	1.5	1.4	1.2	1.1	1.4
31	1.6	---	1.8	1.9	---	1.8	---	1.5	---	1.2	1.1	---
TOTAL	50.0	50.5	61.2	57.0	53.2	55.9	54.9	52.3	42.8	35.4	34.2	33.92
MEAN	1.61	1.68	1.97	1.84	1.9	1.8	1.83	1.69	1.43	1.14	1.1	1.13
AC-FT	99	100	121	113	106	111	109	104	85	70	68	67
MAX	1.7	1.8	2.2	1.9	1.9	1.9	2.1	1.8	1.6	1.4	1.2	1.4
MIN	1.5	1.6	1.8	1.8	1.9	1.8	1.7	1.5	1.3	1	1	0.94

CAL YR	2009	TOTAL	599.3	MEAN	1.64	MAX	2.8	MIN	1.1	AC-FT	1190
WTR YR	2010	TOTAL	581.32	MEAN	1.59	MAX	2.2	MIN	0.94	AC-FT	1150

MAX DISCH: 3.29 CFS AT 13:25 ON Dec. 10,2009 GH 0.68 FT. SHIFT -0.12 FT. (Ice affected)
 MAX GH: 0.82 FT. AT 10:45 ON Nov. 24,2009 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
Water Year 2010

Location.-- Lat. 37°44'03", Long. 105°39'50", UTM X 441450.8, Y 4176532.5, in NE ¼ NW ¼ Sec. 9, T.40 N., R.12 E., NMPM, Alamosa Co., on left bank approximately ½ mile above Los Ojos Diversion.

Drainage and Period of Record.-- 0.3 mi². First record produced in 1999. Flow primarily due to groundwater accretions.

Equipment.-- Data collection platform (Sutron SatLink2 with HDR GOES radio), and a float-operated shaft encoder in a 30 inch diameter pipe well and CMP extension gage shelter. The primary reference gage is a staff gage at LEW in a modified 4 foot Parshall flume. No auxiliary gage. The flume was modified on May 19, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Dec. 3, 2009 through Mar. 31, 2010 when the station was closed for the winter; Nov. 15 through Dec. 2, 2009 when ice in well was affecting floats; and Oct. 31 through Nov. 9, 2009, when the inlet was plugged. Stage-discharge relation was affected by ice in flume on Apr. 2, 2010. There were three shaft encoder corrections; a -0.01 ft on Oct. 15, 2009, a +0.01 ft on May 19, and a +0.01 ft on Sep. 29, 2010. These corrections were prorated back to the previous visit.

Datum Corrections.-- A formal inspection with levels was not performed this year. Since this Parshall Flume has been modified by reducing the area by one-half, it was not expected to perform as a Parshall flume. Inspection and levels were last completed on the flume on July 3, 2008, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage at REW. Levels indicate that the flume floor slopes inconsistently downward toward REW by approximately 0.06 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- The control was a standard four foot Parshall flume until May 19, 2010, when it was modified in an attempt to eliminate the inlet being plugged by sand settling in the flume. Before the modification, the flume was continuously submerged to some extent, and the inlet was often buried and plugged by sand settling in the flume. Shifting is caused by continuously changing sand deposition in, above, and below flume. A new rating (BIGSPGCO03) was developed using measurements made after the flume was modified. Fourteen discharge measurements (Nos. 105-118) were made during the year ranging in discharge from 5.23 to 7.78 cfs. They cover the discharge range encountered. The estimated peak flow of 7.78 cfs (Measured) occurred at 1330 on Dec. 3, 2009 at a gage height of 1.30 ft. with a shift of -0.67 ft. using standard 4 foot Parshall flume rating. The maximum gage-height of 1.32 ft. occurred at 1945 Sep. 22, 2010.

Discharge.-- Shifting control method was used during all open water periods. Measurements show shifts varied from -0.58 to -0.73 ft. while a standard 4 foot rating was in use and from +0.08 to -0.02 ft. after the modification was installed and rating BIGSPGCO03 was used. All were given full weight except for Nos. 114 and 115, which were adjusted 2% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using measurements, weather records, and hydrographic comparison with nearby station Little Spring Creek at Medano Ranch.

Remarks.-- Record is fair except for periods of flume submergence and estimated record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Stanley J. Ditmars .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA

RATING TABLE--

STDPF4FT USED FROM 01-Oct-2009 TO 19-May-2010
STD04FTP4 USED FROM 09-Mar-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	6	7.4	7	7.2	7.2	6.6	6.8	5.5	5.3	5.5	5.6
2	6	6	7.4	7	7.2	7	6.7	6.6	5.5	5.3	5.4	5.6
3	6	5.9	7.4	7	7.2	7	6.8	6.9	5.4	5.3	5.5	5.7
4	6	6	7.4	7	7.2	7	6.8	6.9	5.4	5.3	5.5	5.7
5	6	6	7.4	7	7.2	7	6.8	6.5	5.4	5.3	5.4	5.7
6	6	6	7.4	6.8	7.2	7	6.8	6.2	5.5	5.3	5.4	5.7
7	6.2	6	7.4	6.8	7.2	7	7.1	6.1	5.5	5.3	5.4	5.7
8	6.1	6	7.4	6.8	7.2	7	7	6.2	5.3	5.4	5.5	5.8
9	6.1	5.9	7.4	6.8	7.2	7	6.9	6.4	5.2	5.4	5.4	5.8
10	6	5.9	7.4	6.8	7.2	7	7	6.5	5.2	5.3	5.4	5.8
11	5.9	6.1	7.4	6.8	7.2	7	6.7	6.5	5.2	5.3	5.4	5.8
12	5.8	6.1	7.2	6.8	7.2	7	6.4	6.3	5.3	5.3	5.4	5.8
13	6	6.1	7.2	6.8	7.2	7	6.3	6.3	5.3	5.3	5.4	5.8
14	6	6.4	7.2	6.8	7.2	6.8	6.2	6.4	5.3	5.3	5.4	5.8
15	5.8	6.4	7.2	6.8	7.2	6.8	6.1	6.2	5.3	5.3	5.4	5.8
16	5.8	6.4	7.2	6.8	7.2	6.8	6.3	5.8	5.3	5.3	5.5	5.9
17	5.6	6.6	7.2	6.8	7.2	6.8	6.5	5.7	5.2	5.3	5.5	5.9
18	5.6	6.6	7.2	6.8	7.2	6.8	6.3	5.7	5.2	5.3	5.5	5.9
19	5.5	6.6	7.2	6.8	7.2	6.8	6.1	5.9	5.2	5.3	5.5	5.9
20	5.5	6.6	7.2	7	7.2	6.8	6	5.9	5.2	5.3	5.5	5.8
21	5.6	6.6	7.2	7	7.2	6.8	6	5.8	5.2	5.4	5.5	5.9
22	5.7	6.8	7.2	7	7.2	6.6	6.2	5.7	5.2	5.4	5.5	6.1
23	5.6	6.8	7.2	7	7.2	6.6	7	5.7	5.2	5.4	5.6	6.2
24	5.5	6.8	7.2	7	7.2	6.6	6.9	5.7	5.2	5.4	5.6	6
25	5.6	6.8	7.2	7	7.2	6.4	6.6	5.7	5.3	5.4	5.6	6
26	5.7	6.8	7.2	7	7.2	6.4	6.3	5.6	5.3	5.4	5.6	6
27	5.8	7	7	7	7.2	6.4	6.2	5.6	5.3	5.4	5.6	5.9
28	5.9	7	7	7	7.2	6.4	6.4	5.5	5.4	5.3	5.6	5.9
29	5.9	7.2	7	7	---	6.4	6.6	5.5	5.3	5.4	5.6	6
30	6.1	7.2	7	7	---	6.4	6.7	5.5	5.3	5.4	5.7	6
31	6.2	---	7	7.2	---	6.4	---	5.5	---	5.7	5.7	---
TOTAL	181.4	192.6	224.4	214.4	201.6	210.2	196.3	187.6	159.1	165.8	170.5	175.5
MEAN	5.85	6.42	7.24	6.92	7.2	6.78	6.54	6.05	5.3	5.35	5.5	5.85
AC-FT	360	382	445	425	400	417	389	372	316	329	338	348
MAX	6.2	7.2	7.4	7.2	7.2	7.2	7.1	6.9	5.5	5.7	5.7	6.2
MIN	5.5	5.9	7	6.8	7.2	6.4	6	5.5	5.2	5.3	5.4	5.6

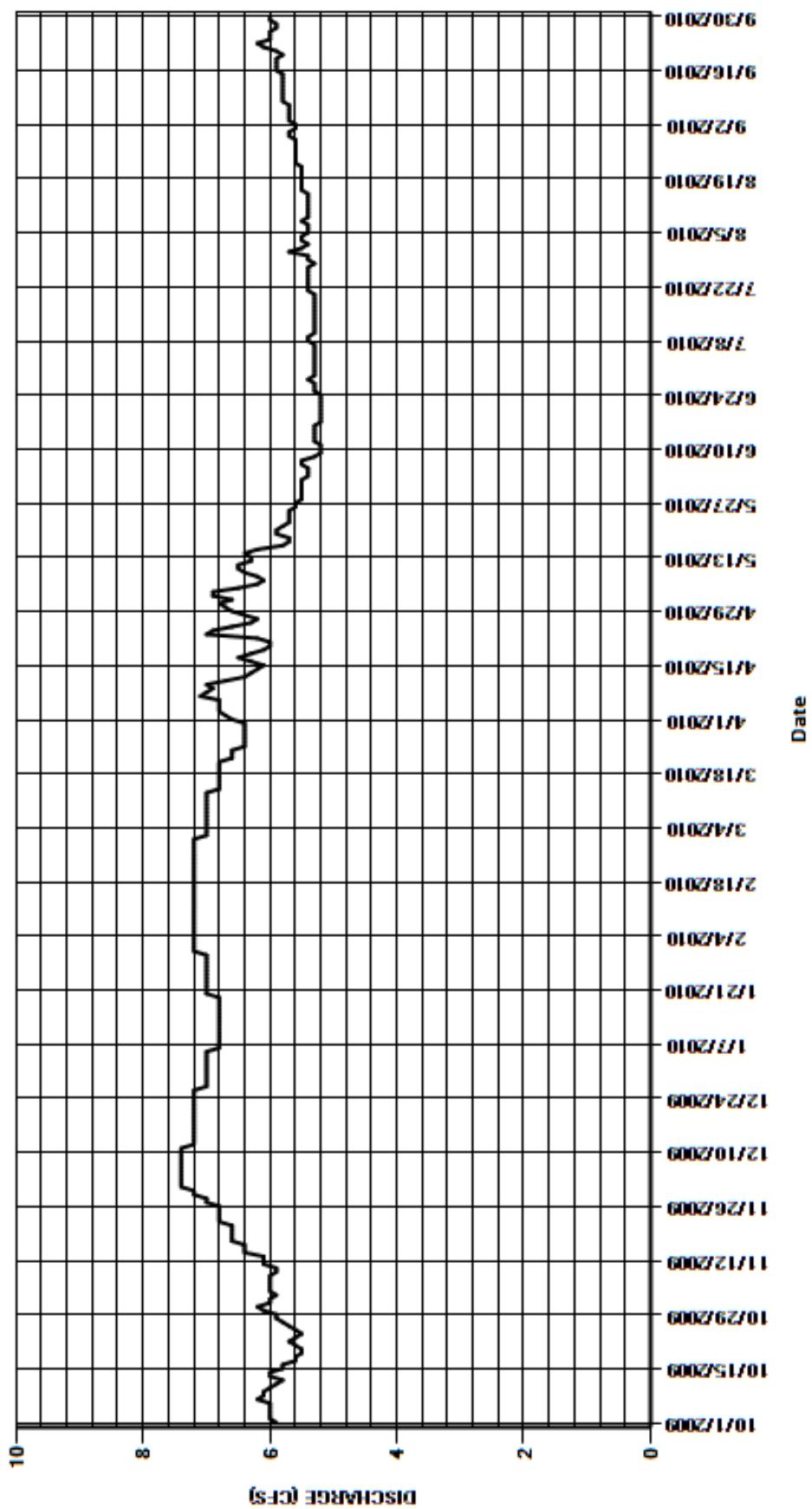
CAL YR	2009	TOTAL	2328.3	MEAN	6.38	MAX	7.8	MIN	5.1	AC-FT	4620
WTR YR	2010	TOTAL	2279.4	MEAN	6.24	MAX	7.4	MIN	5.2	AC-FT	4520

MAX DISCH: 7.78 CFS AT 13:30 ON Dec. 03,2009 GH 1.3 FT. SHIFT -0.67 FT. (Measured)

MAX GH: 1.32 FT. AT 19:45 ON Sep. 22,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08230500 CARNERO CREEK NEAR LA GARITA
Water Year 2010

Location.-- Lat. 37°51'39", Long. 106°18'55", in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec 28, T.42 N., R.6 E., (projected), UTM X 383930.6, Y 4191071.5, Saguache County, Hydrologic Unit 13010004, on left bank 5.5 miles downstream from the North Fork and 4 miles northwest of La Garita, CO.

Drainage and Period of Record.-- 117 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a 42 inch diameter metal shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: Dec. 5-8, 2009 and Mar. 12-28, 2010 when ice in well was affecting floats; Dec. 9, 2009 to Mar. 11, 2010 when station was closed for the winter; Nov. 12, 17-30, December 1-4, 2009, Mar. 29-30, and Apr. 2-9, 2010, when the stage-discharge relation was affected by ice. There were no instrumentation corrections made to the shaft encoder during the year. Two trash corrections were identified: -0.02 ft on Aug. 24 and -0.01 ft on Sep. 20, 2010. Both were prorated from the previous visit.

Datum Corrections.-- Levels were not run at the gage this year. Levels were last run to the reference point (RP) inside the gage on July 17, 2009 using B.M. 2 as base. The gage RP was within the allowable limit, so no correction was made. Levels were also ran on August 28, 2009 when the gage was reset to establish the new reference point elevation and to establish two new bench marks and re-establish BM# 1.

Rating.-- Control is a concrete, broad-crested weir about 25 feet downstream from the gage. Stream banks affect flow at higher stages. Minor shifting occurs as a result of scour and fill just above the gage. Rating 16 was developed and used this year to reflect changes in the approach condition at the gage due to the gage pool being cleaned when the gage was reset August 28, 2009. In addition, the upper end of the rating curve was adjusted to better fit high flow measurements. Rating 16 is well defined from 0.60 to approximately 4 cfs and approximately 12 cfs to 31 cfs; moderately well defined from 4 to 12 cfs, and from 30 to 161 cfs; and poorly defined outside those ranges. Sixteen discharge measurements (Nos. 154-169) were made during the water year, ranging in discharge from 0.28 to 31.2 cfs. They covered the discharge range experienced, except for the higher flows on Apr. 1, 9-13, 15-18, 2010. The peak flow of 85.7 cfs occurred at 2230 on April 10, 2010 at a gage height of 3.03 ft. with a shift of 0.00 ft. It exceeded high measurement No. 161 made on April 7, 2010 at a gage-height of 2.58 ft. by 0.45 feet in stage.

Discharge.-- Shifting-control method was used for all periods of good record. Measurements show shifts varied from -0.02 to +0.01 feet. All measurements were given full weight and applied except for Nos. 165, 167, and 168, which were adjusted as much as 5% and No. 163, which was rated fair and adjusted 6% to smooth shift distribution.

Special Computations.-- Discharge was estimated for periods of no gage-height and ice affected record based on six discharge measurements, and weather records.

Remarks.-- Record is good below 30 cfs and fair above 30 cfs, except for periods of no gage-height and ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner and Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08230500 CARNERO CREEK NEAR LA GARITA

RATING TABLE--

CARLAGCO16 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3	4.1	1.5	0.6	0.5	2	39	16	11	3.1	4.2	1.4
2	2.9	4	1.5	0.6	0.5	2.1	18	17	11	2.8	3.6	0.92
3	2.9	3.6	1	0.7	0.8	2.1	17	15	11	3.1	4.7	0.76
4	2.9	3.6	0.7	0.7	1.5	2.2	17	17	11	3.2	4.8	0.71
5	3	3.9	0.5	0.7	1.5	2.2	20	17	10	2.2	3.9	0.63
6	3	4.4	0.7	0.7	1.4	2.2	20	19	9.7	2	3.6	0.51
7	3	4.5	1	0.6	1.4	2.5	25	18	10	1.9	3.2	0.46
8	3.5	4.4	1	0.5	1.3	2.8	26	17	9.3	2.4	4	0.7
9	3.3	4.1	0.7	0.5	1.4	2.5	37	18	8.6	3.4	3.5	1.2
10	3	3.6	0.3	0.6	1.5	2.4	65	18	7.9	2.9	3.6	1.3
11	3.1	3.9	0.5	0.6	1.6	2.6	56	17	7.6	2.9	2.7	0.86
12	3	4.1	0.7	0.7	1.7	2.8	53	16	7.6	3.2	2.1	0.72
13	3.1	4.5	1	0.8	1.8	3	44	16	7.8	2.7	1.9	0.7
14	3.2	3.2	0.7	0.8	1.8	3	31	16	7.7	3.4	1.7	0.7
15	3.1	2.9	0.5	0.8	1.5	2.7	32	16	9.4	3	1.3	0.74
16	3.1	1.8	0.5	0.8	1.6	3	32	16	7.6	2.1	1.2	0.77
17	3	1.6	0.8	0.7	1.7	3.4	44	15	6.1	1.6	1.4	0.69
18	2.9	2	0.5	0.7	1.7	3.8	39	16	5.4	1.6	1.7	0.64
19	3	2.5	0.5	0.7	1.7	4.5	29	16	4.8	2.3	1.6	0.59
20	3	2	0.5	0.6	1.8	4	25	15	4.3	2.2	1.6	0.58
21	4.9	2	0.8	0.6	1.8	4.5	25	15	4	5	1.5	0.75
22	4.6	2	1	0.6	1.7	4.5	29	15	3.8	6.7	1.2	1.3
23	4	1.7	1	0.5	1.5	5	24	15	3.4	4.9	1.3	2.7
24	3.8	1.5	0.8	0.5	1.5	4.5	19	14	3.3	3.3	2	2.7
25	4.7	1.3	0.5	0.5	1.8	4.5	17	14	3.4	2.9	2.1	1.8
26	3	1.5	0.5	0.5	1.8	4	19	13	4.5	2.2	1.5	1.4
27	2.5	1.3	0.3	0.6	1.8	4	20	13	4.8	2.2	1.2	1.2
28	4	1.5	0.3	0.7	1.8	4.5	21	13	4.1	1.8	1.1	1.2
29	3	1.5	0.5	0.6	---	5.8	22	13	3.9	1.6	1	1.1
30	2.7	1.5	0.5	0.5	---	7	17	12	4.1	2.3	1.1	1.1
31	3.7	---	0.5	0.4	---	24	---	12	---	2.9	1.3	---
TOTAL	101.9	84.5	21.80	19.40	42.40	128.1	882	480	207.1	87.8	71.6	30.83
MEAN	3.29	2.82	0.7	0.63	1.51	4.13	29.4	15.5	6.9	2.83	2.31	1.03
AC-FT	202	168	43	38	84	254	1750	952	411	174	142	61
MAX	4.9	4.5	1.5	0.8	1.8	24	65	19	11	6.7	4.8	2.7
MIN	2.5	1.3	0.3	0.4	0.5	2	17	12	3.3	1.6	1	0.46

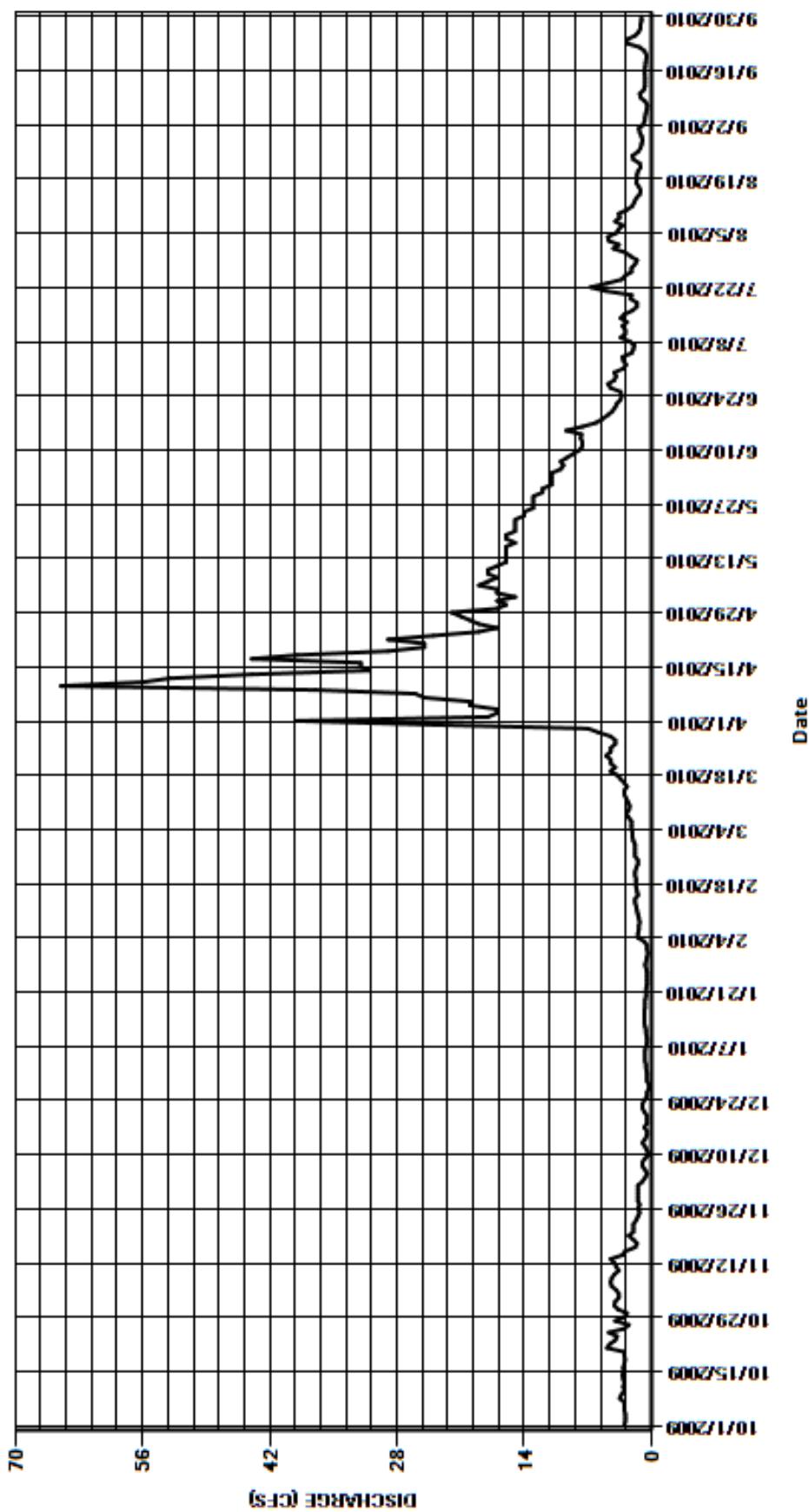
CAL YR	2009	TOTAL	2440.90	MEAN	6.69	MAX	39	MIN	0.3	AC-FT	4840
WTR YR	2010	TOTAL	2157.43	MEAN	5.91	MAX	65	MIN	0.3	AC-FT	4280

MAX DISCH: 85.7 CFS AT 22:30 ON Apr. 10,2010 GH 3.03 FT. SHIFT 0 FT.

MAX GH: 3.03 FT. AT 22:30 ON Apr. 10,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**08230500 CARNERO CREEK NEAR LA GARITA
WY2010 HYDROGRAPH**



RIO GRANDE RIVER BASIN
08231000 LA GARITA CREEK NEAR LA GARITA
Water Year 2010

Location.-- Lat. $37^{\circ}48'48''$, Long. $106^{\circ}19'05''$, UTM X 383931.1, Y 4185923.3, in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, T.41 N., R.6 E., Saguache County, Hydrologic Unit 13010004, on right bank 4.5 mi. downstream from Little La Garita Creek and 4.5 mi. southwest of La Garita, Co.

Drainage and Period of Record.-- 61 mi 2 . Non-recording station Apr. 01, 1919-June 23, 1927. Recording station from June 1927-Oct. 1998, at which time a Data Logger was installed. April 1999 satellite telemetry system installed. Station at various sites all within $\frac{1}{4}$ mile of present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping bucket rain gage in a 4 ft. corrugated metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this year.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 17-30, Dec. 1-25, 2009 and Mar. 12-25, Apr. 2 and 3, 2010, when the stage-discharge relation was affected by ice; Dec. 26-31, 2009 and Jan. 1-5, 2010 when the floats were affected by ice in well; and Jan. 6 to Mar. 11, 2010 when the station was closed for the winter. There were no instrumentation corrections made to the shaft encoder during the year.

Datum Corrections.-- Levels were not run at the gage this year. Levels were last run to the Reference Point (RP) inside the gage on July 17, 2009, using B.M. No. 1 as base. The RP was within allowable limits, so no correction was required or made. Levels were also run on Sep. 11, 2009 when the gage was reset to establish the new reference point elevation and to establish two new bench marks. The PZF on the new control was established at 1.184 ft. Measurements of PZF by wading rod indicated 1.31 ft on Aug. 10, 2010 and 1.29 ft on Aug. 31, 2010.

Rating.-- The control is a rock weir structure approximately 30 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 13 was created and used this year. Seventeen discharge measurements (227-243) were made this year, ranging from 0.59 to 31.4 cfs. The measurements cover the range experienced except for the higher daily flows on Apr. 11, 12, 15-18, 21, 22, 28, 29, 2010 and lower daily flows on Nov. 24, 25, Dec. 5-11, 2009. The peak flow of 66.8 cfs occurred at 0015 on April 17, 2010 at a gage height of 2.90 feet with a shift of +0.01 feet. It exceeded high measurement No. 235 with a gage-height of 2.48 made April 12, 2010 by 0.42 feet in stage.

Discharge.-- Shifting control method was used for all open water periods. A variable shift curve (LAGLAGVS1001) was used to apply shifts according to gage-height from Mar. 10 until Apr. 26, 2010. The measurements show shifts ranged from -0.05 to +0.01 feet. All open water measurements were given full weight and applied except Nos. 227, rated fair and adjusted 8%, 237, and 241 which were adjusted by as much as 4% to smooth the shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice-affected record were estimated using four discharge measurements, weather records and comparison with nearby stations.

Remarks.-- Record is good, except for periods of no gage-height and ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08231000 LA GARITA CREEK NEAR LA GARITA

RATING TABLE--

LAGLAGCO13 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

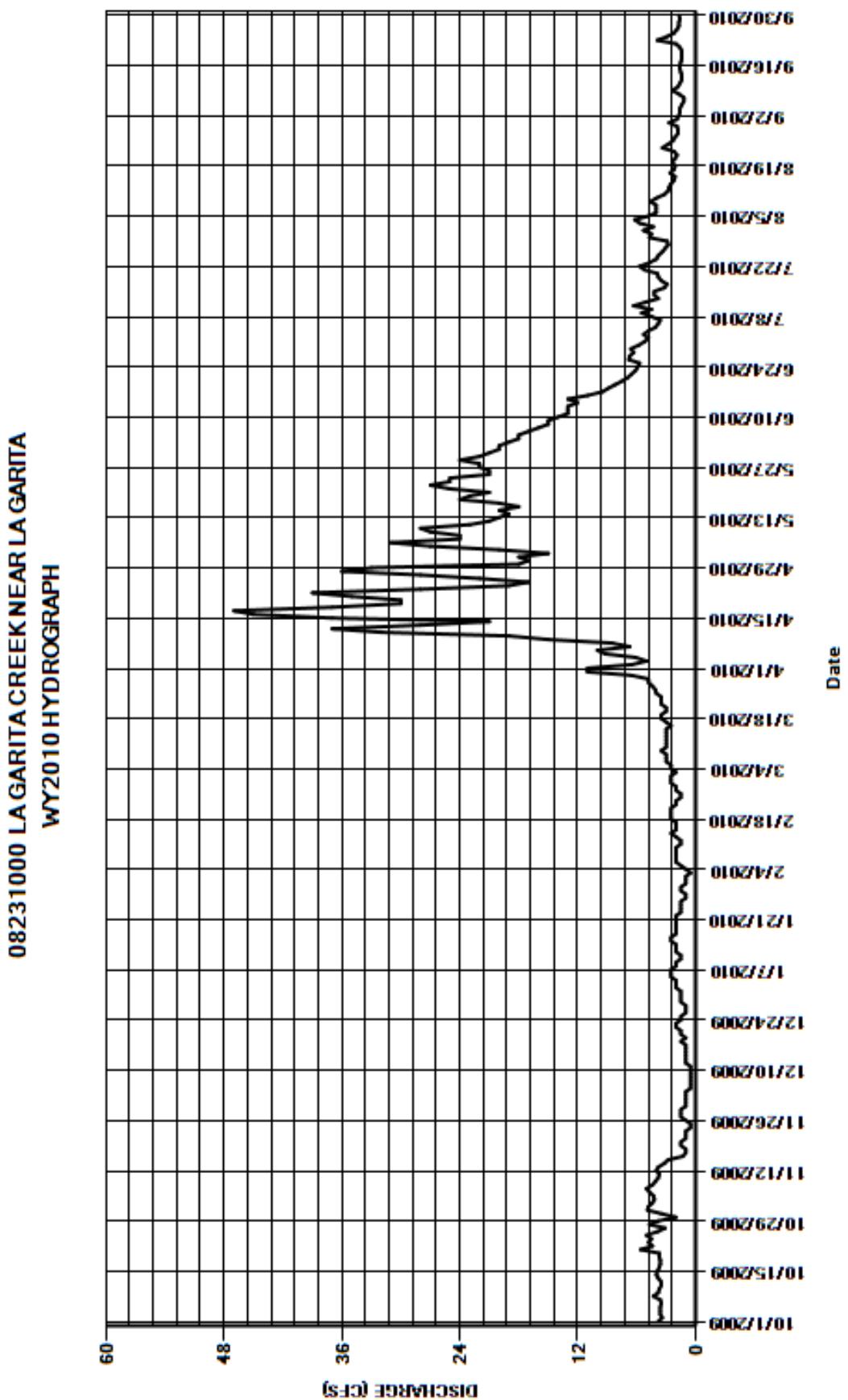
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.8	4.9	1	1.5	1	2.5	11	17	20	5.2	5.3	1.9
2	3.4	4.8	1	2	1	2.5	6.5	18	20	4.8	4.3	1.7
3	3.6	4.4	1	2	0.5	2	5	15	19	5.3	5.7	1.6
4	3.6	4.2	1	2	1	2.5	6.1	20	18	4.8	6.2	1.6
5	3.6	4.3	0.5	2.5	1.5	2.5	9.2	27	18	4.1	4.8	1.4
6	3.5	4.7	0.5	2.5	2	3	10	31	17	3.8	4	1.2
7	3.6	5	0.5	2.5	2	3	6.7	24	16	3.6	4	1.2
8	4.3	4.4	0.5	2	2	3	8.5	24	15	4.5	4	1.7
9	3.8	4.1	0.5	2	2	3.5	15	27	15	5.5	4.6	2.4
10	3.7	3.8	0.5	1.5	2	3	19	28	14	4.5	4	1.8
11	3.5	3.7	0.5	1.5	1.5	3	32	23	13	6.3	3.2	1.6
12	3.5	4	1	2	1.5	3	37	21	13	5.1	2.8	1.4
13	3.8	3.8	1	2	2	3	28	20	13	3.8	2.7	1.4
14	4	3.2	1	2	2.5	3	21	19	12	4.2	2.5	1.5
15	3.9	2.8	1	2.5	2	3	37	20	13	4.2	2.2	1.6
16	3.7	1.3	1	2.5	2	2.5	45	18	11	3.2	2.1	1.6
17	3.6	1	1	2	2	3	47	20	9.5	2.9	2.6	1.5
18	3.6	1	1.5	2	2.5	3.5	37	24	8.9	3.5	2.2	1.4
19	3.7	1.5	1	2	2.5	3.5	30	23	8.2	3.8	2.1	1.4
20	3.7	1.5	1.5	2	2.5	3	30	21	7.5	3.9	2.4	1.4
21	5.6	1	1.5	2	2.5	3	35	25	6.9	5.2	2.1	1.6
22	4.4	1	2	2	2	3.5	39	27	6.5	5.7	1.9	2
23	4.8	1	2	1.5	2	3.5	28	25	6.1	4.7	2.2	3.9
24	4.5	0.5	1.5	1.5	1.5	3.5	19	25	5.9	4	3.4	2.9
25	5	0.5	1.5	1.5	1.5	4	17	21	5.7	3.8	2.8	2.2
26	3.9	1	1	1.5	2	4.1	22	21	6.8	3.4	2.3	1.9
27	3.1	1.5	1	1	2	4.4	28	22	6.7	3.1	2.1	1.7
28	4.7	1.5	1	1	2.5	4.8	36	22	6.3	2.8	1.8	1.7
29	3.8	1.5	1.5	1.5	---	4.8	33	24	6.6	2.9	1.8	1.6
30	2	1	1.5	1.5	---	6.5	18	22	5.8	4.7	1.9	1.7
31	3.5	---	1.5	1	---	11	---	21	---	4.5	2.7	---
TOTAL	119.2	78.90	33.50	57.0	52.00	111.1	716.0	695	344.4	131.8	96.7	52.5
MEAN	3.85	2.63	1.08	1.84	1.86	3.58	23.9	22.4	11.5	4.25	3.12	1.75
AC-FT	236	156	66	113	103	220	1420	1380	683	261	192	104
MAX	5.6	5	2	2.5	2.5	11	47	31	20	6.3	6.2	3.9
MIN	2	0.5	0.5	1	0.5	2	5	15	5.7	2.8	1.8	1.2

CAL YR	2009	TOTAL	3431.10	MEAN	9.4	MAX	53	MIN	0.5	AC-FT	6810
WTR YR	2010	TOTAL	2488.10	MEAN	6.82	MAX	47	MIN	0.5	AC-FT	4940

MAX DISCH: 66.8 CFS AT 00:15 ON Apr. 17,2010 GH 2.9 FT. SHIFT 0.01 FT.

MAX GH: 2.9 FT. AT 00:15 ON Apr. 17,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER BASIN
08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
Water Year 2010

Location.-- Lat 37°24'09", long 106°31'17", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.35, T.37 N., R.4 E., Rio Grande Co. Hydrologic Unit 13010002, Rio Grande National Forest, on left bank 150' upstream from Wightman Fork, 1.9 mi downstream from Bitter Creek, 4.1 mi west of Jasper, and 4.2 mi southeast of Summitville.

Drainage and Period of Record.-- 37.8 mi².

Equipment.-- Shelter is 4 ft x 4 ft x 8 ft steel building. Gage-height is collected using a Sutron Accubar pressure transducer. A Hydrolab instrument collects water temperature, conductance, and pH data. Data collection platform is used to transmit and store data. The Accubar gage-height is set using outside staff gage. This station was moved 500 feet upstream in November 2009. A bank operated cableway was also installed at the site in the fall of 2009 to provide the means to obtain high flow measurements.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Period of operation: Oct. 1 to Nov. 3, 2009 and May 1 to Sep. 30, 2010. Record is complete except for Oct. 1 to Nov. 3, 2009, when gage was isolated; May 1, 2010, when there were missing satellite data; and July 28-31, August 1-15, 23-31, September 1-5, 8-26, 2010, when pressure transducer orifice was buried to the point that the data was of no value.

Datum Corrections.-- Levels were not run at this station this year.

Rating.-- Control is the cobble and small boulder channel and banks. Rating ALAWIGCO_06 was developed using four measurements made from May 1, 2010 to June 2, 2010 and comparison with Alamosa River above Terrace Reservoir and Alamosa below Ranger Creek records. This rating was used to produce flow record for the same period. During high flows at this site in May and June 2010 a large amount of material was deposited in control section. Rating ALAWIGCO_07 was developed using seven measurements made between June 7, 2010 and September 26, 2010. This rating was used to produce flow record for the period from June 2 to September 30, 2010. Control and stream are covered by ice during the winter. Twelve discharge measurements (Nos. 49-60) were made during the period of record. The measurements ranged in discharge from 15.3 to 638 cfs. Measurements covered the discharge range encountered, except for higher mean daily flows on May 29, 30, 2010, lower estimated daily flows of Oct. 1-7, 10-12, 26-31, Nov. 1-3, 2009, and the lower daily flows on Aug. 22, Sept. 7, 2010. The peak flow of 1030 cfs occurred at 2000 on May 29, 2010 at a gage height of 6.60 ft. (-0.36 ft. GH Corr. applied) with a shift of -0.10 ft. using rating ALAWIGCO_06. It exceeded high measurement No. 54 (GH = 6.34 ft) made June 7, 2010, by 0.26 feet in stage.

Discharge.-- Shifting control method was used during the entire period of record. A shift curve (ALAWIGCOVS1001) was used from May 1-22, 2010 to apply shifts by stage. The curve was left open ended because the range in stage is well defined by measurements during this period. For the remainder of the year shifts were applied as defined by measurements and distributed by time with consideration given to change in stage and events. Measurements show shifts varied from -0.10 to +0.08 ft. with rating ALAWIGCO_06 and 0.00 to +0.23 with rating ALAWIGCO_07. All were given full weight and applied.

Special Computations.-- Discharge for periods of missing or bad record was based on discharge measurements, weather records, partial stage records, and comparison with nearby stations Wightman Fork at Mouth near Jasper and Alamosa River below Ranger Creek.

Remarks.-- Due to the apparent inability of the pressure transducer installation to consistently and accurately track stream stage (painting, trash hanging up on the installation, unexplained pressure transducer corrections) and the instability of the channel and control, the record is rated fair. Periods of missing gage-height and periods when orifice became buried to the point the data was useless are rated poor. Due to uncertainty in the upper end of rating curve and distribution of several corrections due to the pressure transducer orifice being partially buried, the periods of May 24-31, June 1, 2, July 23, 24, 2010, including peak gage-height and flow data are also considered poor. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER

RATING TABLE--

ALAWIGCO_06 USED FROM 01-May-2010 TO 02-Jun-2010
ALAWIGCO_07 USED FROM 02-Jun-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	11	--	--	--	--	--	60	467	54	42	21
2	11	11	--	--	--	--	--	53	432	61	30	18
3	11	11	--	--	--	--	--	51	423	74	72	17
4	11	--	--	--	--	--	--	61	450	52	53	17
5	11	--	--	--	--	--	--	101	499	43	44	16
6	11	--	--	--	--	--	--	140	506	40	39	15
7	13	--	--	--	--	--	--	152	511	38	39	14
8	17	--	--	--	--	--	--	182	476	45	33	28
9	15	--	--	--	--	--	--	222	418	64	30	41
10	14	--	--	--	--	--	--	222	359	42	26	28
11	14	--	--	--	--	--	--	181	313	38	24	24
12	13	--	--	--	--	--	--	180	267	36	23	22
13	16	--	--	--	--	--	--	166	220	33	22	20
14	16	--	--	--	--	--	--	134	181	32	20	19
15	16	--	--	--	--	--	--	158	163	30	18	17
16	17	--	--	--	--	--	--	224	165	28	16	17
17	16	--	--	--	--	--	--	291	155	28	17	16
18	17	--	--	--	--	--	--	271	143	29	16	16
19	16	--	--	--	--	--	--	203	131	28	16	15
20	17	--	--	--	--	--	--	260	121	24	19	15
21	19	--	--	--	--	--	--	376	113	25	16	15
22	16	--	--	--	--	--	--	426	102	28	14	18
23	16	--	--	--	--	--	--	416	90	31	16	38
24	16	--	--	--	--	--	--	353	88	20	17	24
25	17	--	--	--	--	--	--	268	84	19	22	19
26	13	--	--	--	--	--	--	290	92	20	18	18
27	12	--	--	--	--	--	--	374	74	18	17	18
28	13	--	--	--	--	--	--	563	64	17	16	17
29	9	--	--	--	--	--	--	700	60	25	19	16
30	13	--	--	--	--	--	--	641	57	32	25	15
31	12	--	--	--	--	--	--	498	---	47	33	---
TOTAL	442.0	33	--	--	--	--	--	8217	7224	1101	812	594
MEAN	14.3	11	--	--	--	--	--	265	241	35.5	26.2	19.8
AC-FT	877	65	--	--	--	--	--	16300	14330	2180	1610	1180
MAX	19	11	--	--	--	--	--	700	511	74	72	41
MIN	9	11	--	--	--	--	--	51	57	17	14	14

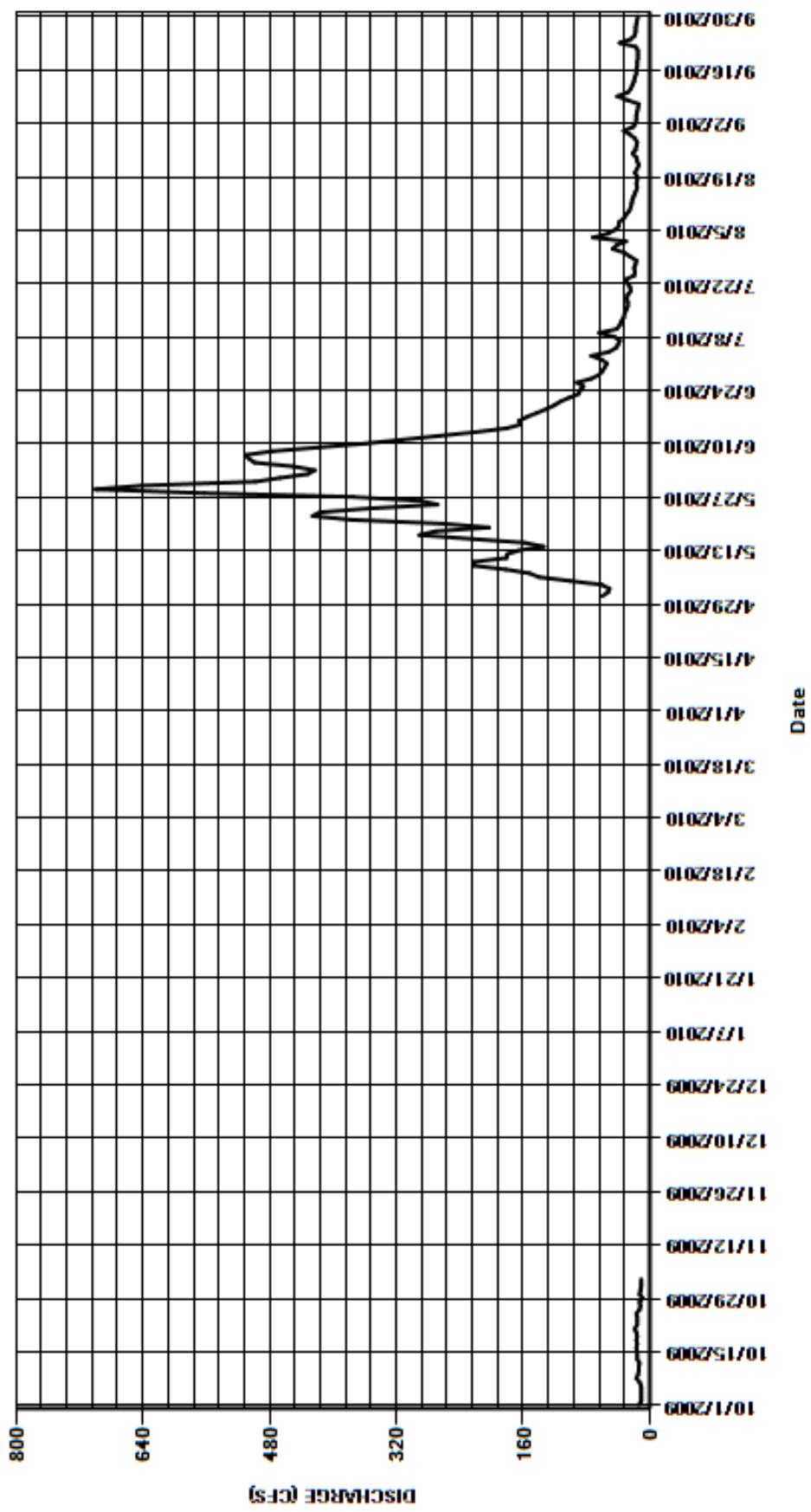
CAL YR	2009	TOTAL	24303.0	MEAN	131	MAX	828	MIN	9	AC-FT	48210	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	18423.0	MEAN	98.5	MAX	700	MIN	9	AC-FT	36540	(PARTIAL YEAR RECORD)

MAX DISCH: 1030 CFS AT 20:00 ON May. 29,2010 GH 6.6 FT. SHIFT -0.1 FT. (GH CORR. -0.36 FT. APPLIED)

MAX GH: 6.6 FT. AT 20:00 ON May. 29,2010 (GH CORR. -0.36 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
Water Year 2010

Location.-- Lat. $37^{\circ}25'45''$, Long. $106^{\circ}35'03''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, T.37N., R.4 E., Rio Grande Co., Hydrologic Unit 13010002, on left bank about 200 ft. downstream from Cropsy Creek, and 0.25 mi east of Summitville.

Drainage and Period of Record.-- 4.44 mi². July 1995 to current year (seasonal records only).

Equipment.-- Sutron Accubar non-submersible pressure transducer with Sutron 8200 data collection platform in a 4-ft. by 4-ft. by 8-ft. steel shelter. The primary reference is the outside staff gage. No changes this year.

Hydrologic Conditions.--

Gage-Height Record.-- Record is complete for period of operation from Oct. 1 to Nov. 7, and from May 8 to Sept. 30, except for Nov. 7, 2009 and May 8, 2010 when there was missing data, and May 31 - Jun. 19, 2010 when the pressure transducer orifice was buried. The stage-discharge relationship was affected by ice Oct. 1-3, 6, 7, 9, 10, 22-27, 2009. Gage-height record is not considered reliable May 8-30, 2010 due to large instrument corrections that vary with stage and are undefined. A piece of wire was found and removed from the orifice on Jun. 19, 2010 resulting in a correction of 0.26 feet. During other periods, instrument corrections were applied as needed and prorated by time back to the previous visit.

Datum Corrections.-- Levels are not run at this site.

Rating.-- Control is small, low rock and log dam. Channel is also part of the control. The control is subject to change from high water and excavations in the channel upstream. Control and stream ice up during the winter. Rating (WFKCRO05-1) was developed using measurements made after the gage pool was cleaned out July 3, 2009 and used for the period of record and is poorly defined. Nine measurements (Nos. 44-52) were made this year ranging in discharge from 0.61 to 25.5 cfs. Measurements cover the discharge range experienced except for the lower mean daily flows of Aug. 21, Sep. 2, 4-7, 15, 17, 18, 28, 2010 and the higher daily flows of May 8-13, 15-31, Jun. 1-7, 2010. The peak flow and gage-height cannot be determined due to indeterminate gage-height correction.

Discharge.-- Shifting control method was used for all periods of record. Shifts were applied by time. Measured shifts ranged from -0.29 ft. to 0.00 feet. All measurements were given full weight and applied.

Special Computations.-- All applied offsets were removed from gage-height record to analyze raw data since the numerous corrections appeared to be stage-related. This analysis revealed a very good linear slope correlation using measurement Nos. 45, 46, and 47. A site visit was made on May 23 with no measurement due to unsafe high water conditions. Interestingly, this was the only visit during runoff period that didn't require a correction, which seemed highly unlikely. It was assumed that the staff gage was misread by 1.00 foot too low. By adding this 1.00 foot to the staff gage reading, the line from above linear correlation went directly through this point. For estimation of discharge values from May 8-30, this linear equation was applied to all gage-heights after removing applied offsets. A maximum gage-height of 6.99 feet was calculated, but not used due to uncertainties involved. This linear equation indicates a slope value of 2.4614 and r-squared value of 0.9999 during the period when wire was inside orifice tube. A variable shift curve was created and used during this period to redefine the upper end of the rating. After removing the wire, the indicated slope value was 0.746. This second equation was not used, but indicates that Accubar unit needs repair/calibration.

Remarks.-- Record is poor. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.

Recommendations.-- Accubar pressure transducer should be properly calibrated and site visit log including documentation of current offset and slope along with adjustments and times of adjustments should be maintained. Staff gage readings should be recorded with every change in offset or slope. If the pressure sensor is painting, multiple readings of Accubar may be needed to obtain a mean instrument gage height. These may be recorded individually or as a range. It would be helpful to program the Accubar to 'average' the readings.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE

RATING TABLE--

WFKCROCO05-1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.7	0.88	---	---	---	---	---	---	45	4.9	4.2	1.1
2	0.7	0.93	---	---	---	---	---	---	40	6.2	3.8	0.6
3	0.7	0.94	---	---	---	---	---	---	40	7	8.8	0.87
4	0.67	1	---	---	---	---	---	---	45	5	4.3	0.51
5	0.67	1.1	---	---	---	---	---	---	50	4.5	2.5	0.38
6	0.7	1.1	---	---	---	---	---	---	40	2.6	1.9	0.29
7	0.7	1.1	---	---	---	---	---	---	30	3.7	2.1	0.25
8	1.1	---	---	---	---	---	---	27	26	7.4	2.2	3.1
9	1.1	---	---	---	---	---	---	55	22	7	2.1	2.5
10	2.2	---	---	---	---	---	---	54	17	5	1.7	1.3
11	3.3	---	---	---	---	---	---	47	15	4.6	1.4	1.1
12	3.1	---	---	---	---	---	---	53	12	4.6	1.1	1.1
13	3.5	---	---	---	---	---	---	33	9.8	4.4	1.1	1.2
14	3.9	---	---	---	---	---	---	15	8.9	4.4	1.2	0.83
15	4.5	---	---	---	---	---	---	42	7.9	4.3	1.2	0.55
16	4.5	---	---	---	---	---	---	86	7.5	4.2	1.4	0.68
17	4.3	---	---	---	---	---	---	123	6.5	4.3	1.5	0.6
18	4.2	---	---	---	---	---	---	82	6.1	4.7	1.4	0.56
19	4.2	---	---	---	---	---	---	73	7	4.6	1.4	0.61
20	1.2	---	---	---	---	---	---	156	6.9	5.3	1.3	0.72
21	1.1	---	---	---	---	---	---	140	6.1	5.3	0.58	0.76
22	1	---	---	---	---	---	---	119	4.8	5.5	0.66	1.9
23	1	---	---	---	---	---	---	122	5.5	5.5	1	2.6
24	1	---	---	---	---	---	---	48	5.5	4.6	3.4	1.3
25	1	---	---	---	---	---	---	59	5.6	4	2.3	1.1
26	0.9	---	---	---	---	---	---	96	5.8	3.8	1.4	0.96
27	0.9	---	---	---	---	---	---	142	5.3	3.8	1.3	0.64
28	0.82	---	---	---	---	---	---	134	5.4	4.8	1.7	0.49
29	0.77	---	---	---	---	---	---	94	5.3	4.6	1.9	0.68
30	0.73	---	---	---	---	---	---	61	5.1	5	4.7	1.4
31	0.79	---	---	---	---	---	---	49	---	5.3	2.2	---
TOTAL	55.95	7.05	---	---	---	---	---	1910	497.0	150.9	67.74	30.68
MEAN	1.8	1.01	---	---	---	---	---	79.6	16.6	4.87	2.19	1.02
AC-FT	111	14	---	---	---	---	---	3790	986	299	134	61
MAX	4.5	1.1	---	---	---	---	---	156	50	7.4	8.8	3.1
MIN	0.67	0.88	---	---	---	---	---	15	4.8	2.6	0.58	0.25

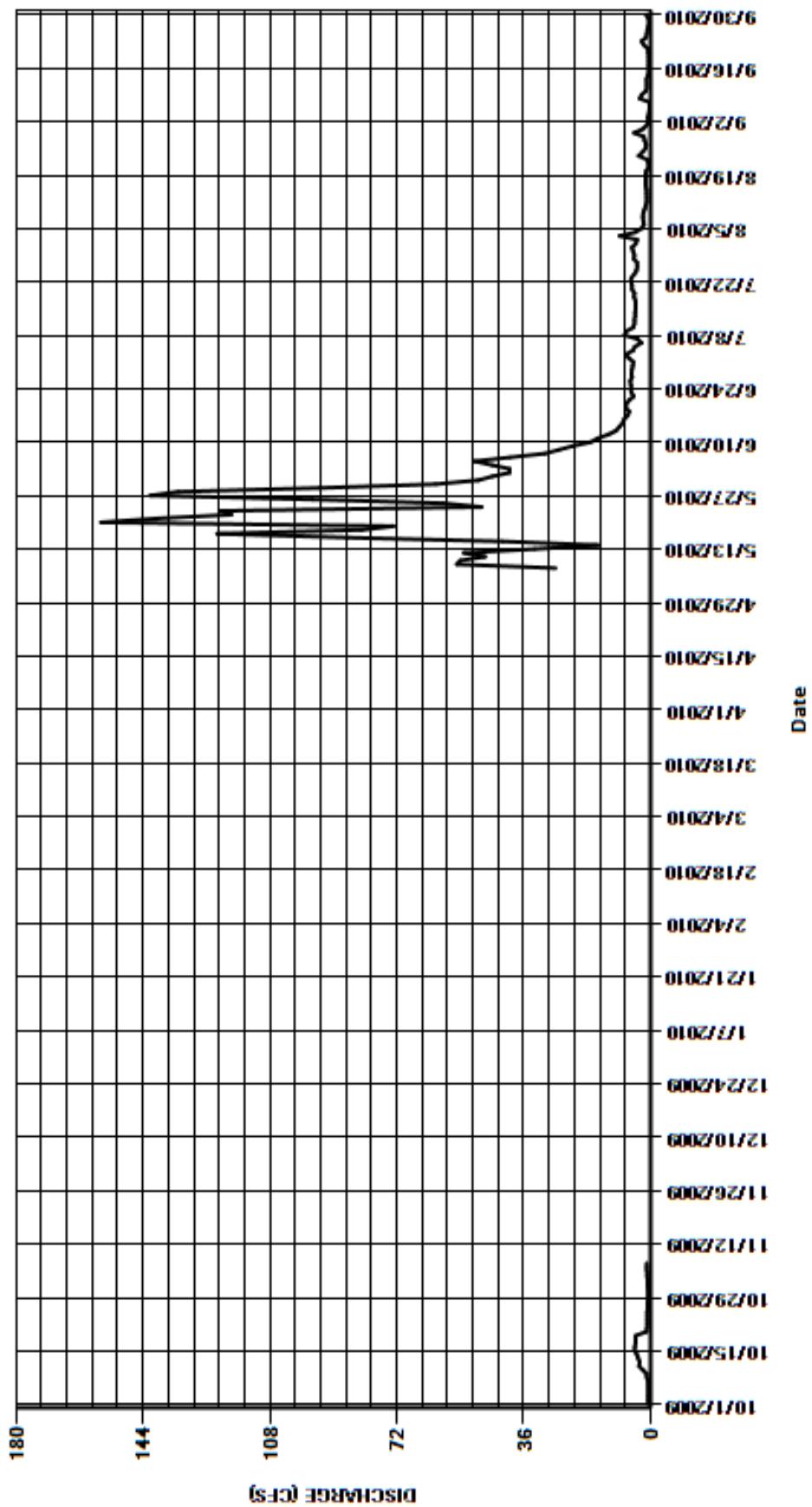
CAL YR	2009	TOTAL	2226.00	MEAN	11.8	MAX	69	MIN	0.19	AC-FT	4420 (PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	2719.32	MEAN	14.8	MAX	156	MIN	0.25	AC-FT	5390 (PARTIAL YEAR RECORD)

MAX DISCH: Not determined.

MAX GH: FT. Not determined.

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
WY2010 HYDROGRAPH**



RIO GRANDE RIVER BASIN
08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER
Water Year 2010

Location.-- Lat. $37^{\circ}24'14''$, Long. $106^{\circ}31'16''$, in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.37 N., R.4 E., Rio Grande County, Hydrologic Unit 13010002, on right bank 25' downstream from bridge on Forest Development Road No. 250, about 300' upstream from confluence with Alamosa River, and 4.3 mi southwest of Jasper.

Drainage and Period of Record.-- 16.1 mi². July 1995 to current year (seasonal record only).

Equipment.-- Shelter is 4 ft x 4 ft x 8 ft steel building. Shelter also houses equipment for station 'Alamosa River above Wightman Fork.' Contact with stream to determine water levels is by use of Sutron Accubar. Equipment includes Hydrolab to obtain water quality information. Data is stored in data collection platform (DCP) and transmitted to satellite. The primary reference gage is outside staff gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the period of operation, October 1-November 3, 2009, May 1 to September 30, 2010, except for November 3, 2009 and May 1, 2010 when there was missing satellite data, and June 18, 19, 2010 when the PVC pipe that houses the orifice line was buried isolating the pressure transducer; and October 26-31, November 1-2, 2009, when the stage-discharge relation was affected by ice. There were three minor pressure transducer corrections during the period of record; June 19, July 5, and July 24. All were prorated from the previous visit.

Datum Corrections.-- No levels were run this water year.

Rating.-- Control is stream channel and stream banks. Control is fairly stable, but ices up in winter. Rating No. 6 was used for the period of record. Ten discharge measurements (Nos. 58-67) were made during the water year ranging from 1.91 to 283 cfs. Measurements covered the daily mean discharge range encountered. The peak flow during the period of record of 523 cfs occurred at 1745 on May 21, 2010 at a gage height of 5.15 feet with a shift of -0.08 feet. It exceeded high measurement No. 61, made May 22, 2010 (GH = 4.84 ft, 283 cfs, Shift = -0.08 ft) by 0.31 feet in stage.

Discharge.-- Shifting-control method was used for the period of record. A shift curve (WFKMOUCOVSCO1001) was used from May 1 – May 22, 2010 another shift curve (WFKMOUCOVSCO1002) was used from May 22 to July 24, 2010 to apply shifts according to stage. During other periods, shifts were applied as defined by measurements and distributed by time. All measurements were given full weight and applied except for No. 60 which was adjusted by 2% to better fit the shift curve. Shifts for the ten measurements made during the record period ranged from -0.08 to -0.24 feet.

Special Computations.-- Discharge during periods of missing record and ice effect were estimated using temperature records, partial day good record and good record before and after affected periods.

Remarks.-- Record is good, except for ice affected periods and periods of missing data, which are poor. The peak discharge should be considered poor due to the fact that the peak discharge is 185% greater than the highest measured flow. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER

RATING TABLE--

WFKMOUC006 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

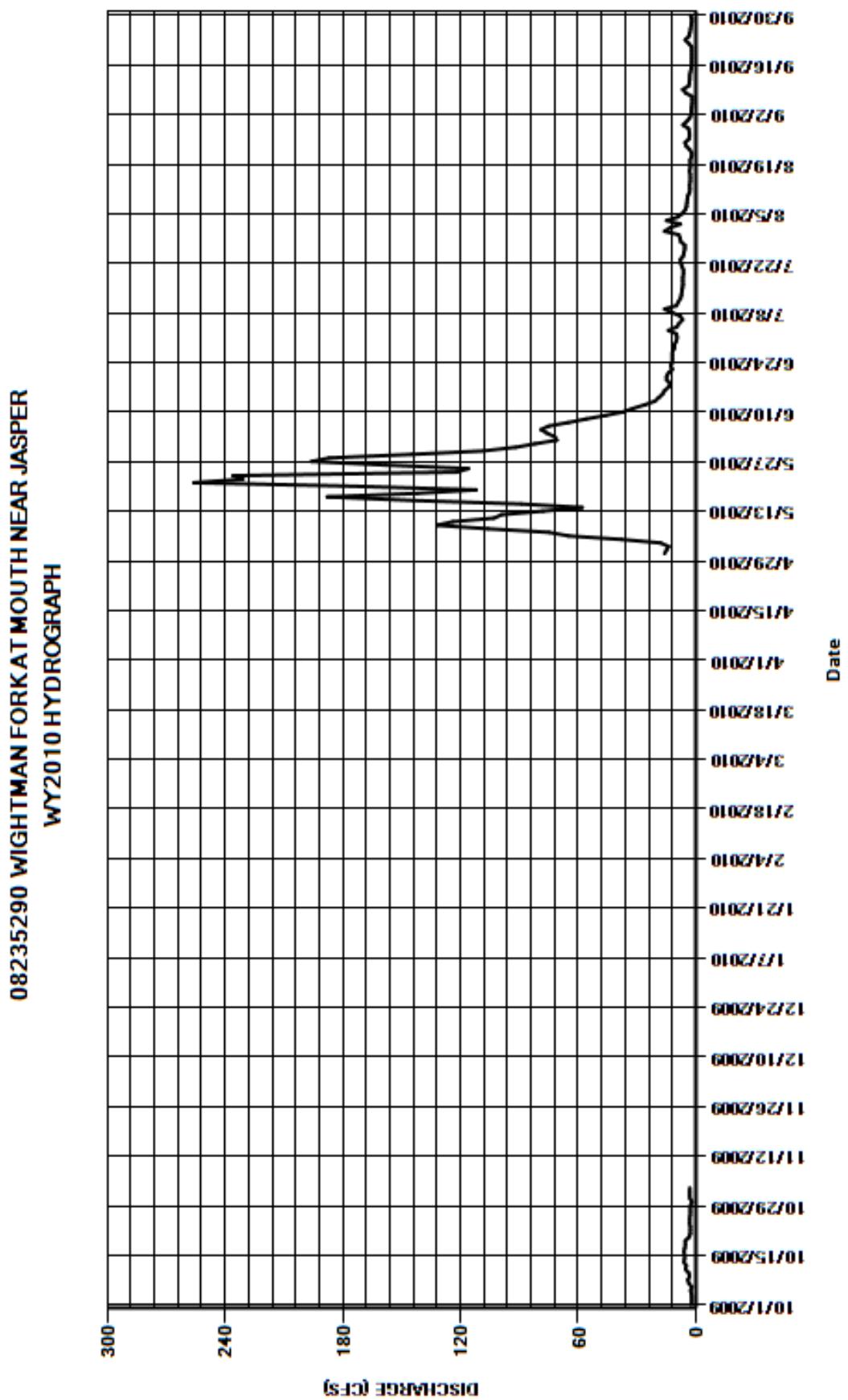
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	3.2	---	---	---	---	---	16	82	9.6	13	3.1
2	2.1	3.2	---	---	---	---	---	15	71	10	7.9	2.4
3	2.1	3.2	---	---	---	---	---	14	72	14	15	2.4
4	2.3	---	---	---	---	---	---	18	76	9.7	9.3	2.2
5	2.7	---	---	---	---	---	---	38	79	8.6	6.9	2
6	2.1	---	---	---	---	---	---	65	75	6.8	5.5	1.9
7	3.6	---	---	---	---	---	---	75	65	7.9	4.8	1.9
8	4.1	---	---	---	---	---	---	106	56	12	4.6	5.1
9	3.2	---	---	---	---	---	---	132	46	16	4.4	6.7
10	3.7	---	---	---	---	---	---	124	37	9.9	4.1	3.7
11	5.4	---	---	---	---	---	---	103	32	9	3.2	3.3
12	4.9	---	---	---	---	---	---	99	26	7.9	3	3.2
13	6.1	---	---	---	---	---	---	78	21	7.4	3.2	3.1
14	5.8	---	---	---	---	---	---	58	19	7.2	2.9	2.8
15	5.8	---	---	---	---	---	---	89	17	6.9	2.8	2.4
16	6.1	---	---	---	---	---	---	144	16	6.6	2.9	2.3
17	5.7	---	---	---	---	---	---	188	14	6.8	3.2	2.2
18	5.4	---	---	---	---	---	---	142	13	6.7	2.9	2.1
19	5.5	---	---	---	---	---	---	112	15	6.4	2.9	2.1
20	3.6	---	---	---	---	---	---	172	15	6.3	3	2.2
21	2.9	---	---	---	---	---	---	256	14	7.1	2.3	2.2
22	2.8	---	---	---	---	---	---	231	12	7.7	2.1	3.7
23	2.8	---	---	---	---	---	---	236	13	7.9	3.1	5.5
24	3.2	---	---	---	---	---	---	122	12	6.5	4.9	3.6
25	3.1	---	---	---	---	---	---	116	12	6.1	5.6	3.1
26	3	---	---	---	---	---	---	158	12	5.7	3.6	2.8
27	2.8	---	---	---	---	---	---	196	12	5.6	3.2	2.5
28	2.8	---	---	---	---	---	---	187	11	7.7	3.4	2.2
29	2.8	---	---	---	---	---	---	145	11	8.1	3.8	2.2
30	2	---	---	---	---	---	---	108	10	8.8	6.6	2.8
31	3	---	---	---	---	---	---	92	---	16	4.7	---
TOTAL	113.9	9.6	---	---	---	---	---	3635	966	262.9	148.8	87.7
MEAN	3.67	3.2	---	---	---	---	---	117	32.2	8.48	4.8	2.92
AC-FT	226	19	---	---	---	---	---	7210	1920	521	295	174
MAX	6.1	3.2	---	---	---	---	---	256	82	16	15	6.7
MIN	2	3.2	---	---	---	---	---	14	10	5.6	2.1	1.9

CAL YR	2009	TOTAL	5996.9	MEAN	32.2	MAX	259	MIN	1.8	AC-FT	11890	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	5223.9	MEAN	27.9	MAX	256	MIN	1.9	AC-FT	10360	(PARTIAL YEAR RECORD)

MAX DISCH: 523 CFS AT 17:45 ON May. 21,2010 GH 5.15 FT. SHIFT -0.08 FT.

MAX GH: 5.15 FT. AT 17:45 ON May. 21,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER BASIN
ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
Water Year 2010

Location.--	Lat. 37°23'23", Long. 106°22'41", UTM X 378078.0, Y 4138906.2, Conejos County, on right bank, 30' above Silver Lakes Road Bridge, 0.4 miles below Ranger Creek and 4 miles above Terrace Reservoir.
Drainage and Period of Record.--	N/A. Station established in water year 2003.
Equipment.--	Shelter is 4 ft x 4 ft x 8 ft steel building equipped with Sutron Accubar to collect stream level data and Hydrolab to obtain water quality information. Data collection platform (DCP) used to store collected data and transmit to satellite. Outside staff gage installed as base gage.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable for the period of operation, Oct. 1 to Nov. 3, 2009 and May 1 to Sep. 30, 2010, except for Nov. 3, 2009, and May 1, 2010, when there was missing data; and Oct. 29 – 31, Nov. 1, 2, 2009, when the stage-discharge relation was affected by ice. There were four small pressure transducer corrections on Jul. 5, 24, Aug. 15, and Sep. 5, 2010. The corrections were prorated from the previous visit.
Datum Corrections.--	Levels were not run at this station this year.
Rating.--	Control is primarily stream channel of rock and earthen banks. Bridge on downstream side of gage is also part of the control. Channel is stable at low and medium flows, but can change at very high flows. Stream is covered by ice during winter months. Rating No. 5_1 was used for this year's period of record. It was developed using recent discharge measurements and the Aquarius rating table development software. Ten discharge measurements (Nos. 60-69) were made during period of record for this water year ranging in discharge from 21.1 to 657 cfs. Measurements cover the range encountered except for the lower daily flow on Oct. 2–6, 27, 29–31, Nov. 1–3, 2009 and the higher daily flows on May 21–23, 27–30, June 6, 7, 2010. The peak flow of 1130 cfs occurred at 2315 on May 28, 2010 at a gage height of 5.72 ft. with a shift of -0.03 ft. It exceeded high measurement No. 63 (GH=4.79 ft.), made May 22, 2010 by 0.93 feet in stage.
Discharge.--	Shifts were applied by time for the period of record from Oct. 1 to Nov. 3, 2009. Shifts were applied according to stage for the remainder of the period of record using three shift curves; ALARANCOVS01, May 1 – July 5, ALARANCOVSC02, July 5 – August 15, and ALARANCOVSC03, August 15 – September 30, 2010. Measurement 62 was not used due to equipment failure. Measurements show shifts ranging from -0.06 to +0.02 feet. All measurements used were given full weight and applied except No. 60 which was adjusted 5% to smooth shifts between measurements. Measurement Nos. 64 and 67 were adjusted 1%, measurement No. 66 was rated fair and adjusted 7 % to better fit the shift curves used.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using good record from the Alamosa River above Terrace Reservoir gaging station and two measurements.
Remarks.--	The plotted gage-height record indicates that the Accubar pressure sensor continuously 'hunts' the point of pressure equilibrium. This hunting creates some uncertainty in gage-height record. Due to this uncertainty, the record should be considered fair except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.
Recommendations.--	Sensor calibration is recommended for WY2011 to help identify and alleviate problems with the pressure transducer.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER

RATING TABLE--

ALARANCO05_1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	19	---	---	---	---	---	145	569	82	69	33
2	18	19	---	---	---	---	---	125	524	82	48	28
3	18	19	---	---	---	---	---	112	507	98	111	27
4	18	---	---	---	---	---	---	124	553	80	80	26
5	19	---	---	---	---	---	---	198	642	70	66	25
6	18	---	---	---	---	---	---	316	692	62	57	23
7	22	---	---	---	---	---	---	351	670	58	57	22
8	29	---	---	---	---	---	---	406	622	72	49	45
9	24	---	---	---	---	---	---	487	545	113	45	65
10	24	---	---	---	---	---	---	496	473	71	39	43
11	25	---	---	---	---	---	---	402	403	64	35	37
12	24	---	---	---	---	---	---	377	343	59	34	34
13	29	---	---	---	---	---	---	349	267	52	33	31
14	29	---	---	---	---	---	---	267	218	49	29	29
15	29	---	---	---	---	---	---	298	193	46	27	27
16	30	---	---	---	---	---	---	419	192	42	26	26
17	29	---	---	---	---	---	---	554	180	40	27	25
18	29	---	---	---	---	---	---	525	168	44	25	24
19	29	---	---	---	---	---	---	395	157	42	24	23
20	28	---	---	---	---	---	---	467	147	38	25	23
21	30	---	---	---	---	---	---	667	139	39	23	23
22	26	---	---	---	---	---	---	729	128	39	22	29
23	26	---	---	---	---	---	---	689	118	47	25	59
24	26	---	---	---	---	---	---	611	113	42	28	37
25	27	---	---	---	---	---	---	459	113	35	35	30
26	21	---	---	---	---	---	---	546	120	33	28	28
27	20	---	---	---	---	---	---	692	107	30	26	26
28	22	---	---	---	---	---	---	836	94	30	25	26
29	16	---	---	---	---	---	---	863	89	41	29	25
30	20	---	---	---	---	---	---	715	86	52	41	25
31	20	---	---	---	---	---	---	600	---	78	49	---
TOTAL	747	57	---	---	---	---	---	14220	9172	1730	1237	924
MEAN	24.1	19	---	---	---	---	---	459	306	55.8	39.9	30.8
AC-FT	1480	113	---	---	---	---	---	28210	18190	3430	2450	1830
MAX	30	19	---	---	---	---	---	863	692	113	111	65
MIN	16	19	---	---	---	---	---	112	86	30	22	22

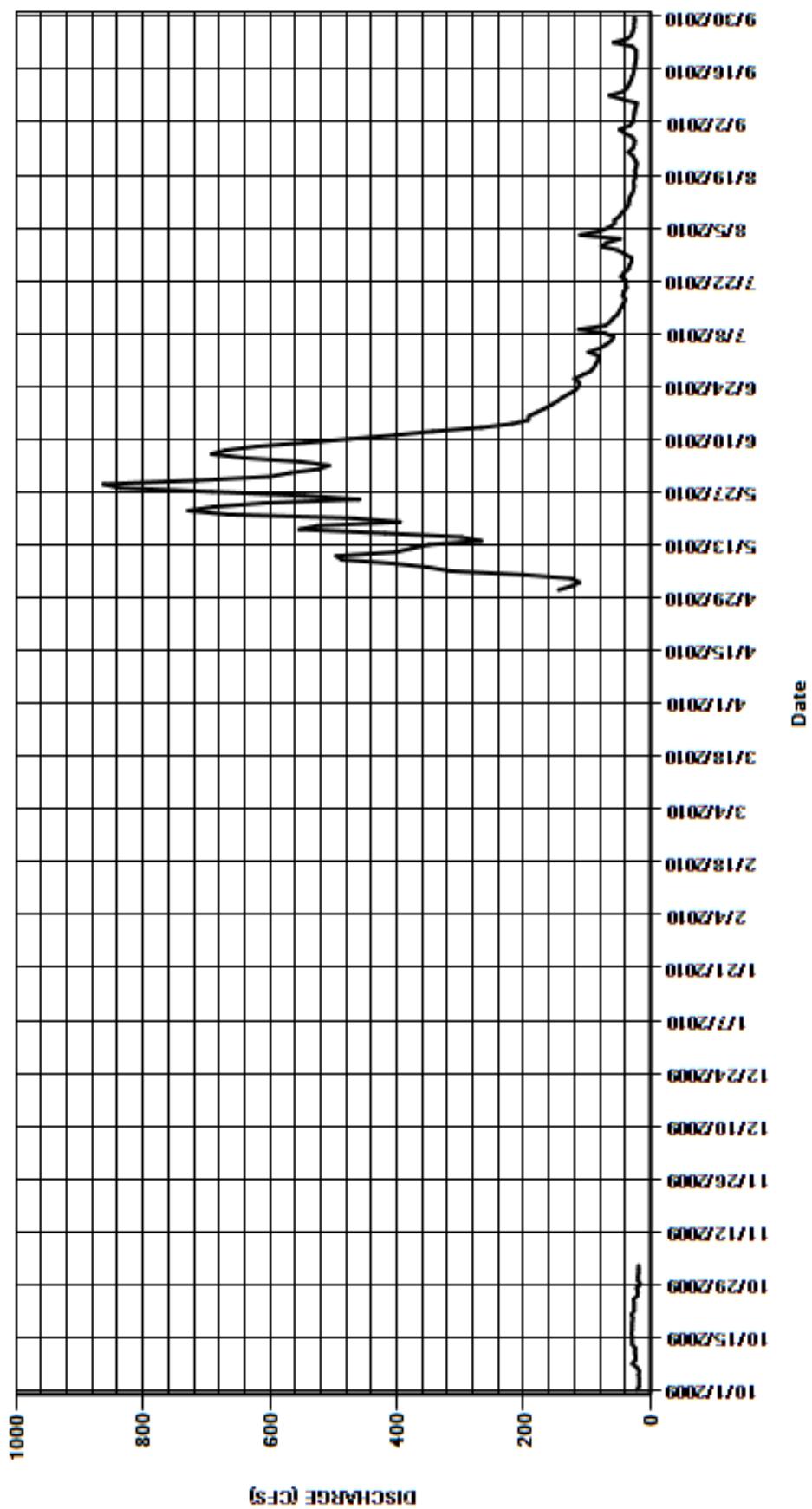
CAL YR	2009	TOTAL	36513	MEAN	196	MAX	1030	MIN	16	AC-FT	72420	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	28087	MEAN	150	MAX	863	MIN	16	AC-FT	55710	(PARTIAL YEAR RECORD)

MAX DISCH: 1130 CFS AT 23:15 ON May. 28,2010 GH 5.72 FT. SHIFT -0.03 FT.

MAX GH: 5.72 FT. AT 23:15 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR
Water Year 2010

Location.-- Lat. 37°22'29", Long. 106°20'03", UTM X 381821.2, Y 4137279.0, in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, T.36 N., R.6 E., Conejos County, Hydrologic Unit 13100002, on left bank 0.8 mi upstream from high-water line of Terrace Reservoir at elevation 8,568 ft., 3.0 mi. downstream from French Creek, and 15 mi. northwest of Capulin.

Drainage and Period of Record.-- 107 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and air temperature sensor in a 4-ft. diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 10 feet below gaging station. No changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Oct. 30, 31, Nov. 15-30, Dec. 1-8, 2009, and April 2, 3, 6-8, 2010, when the stage-discharge relation was affected by ice; Dec. 9, 2009 when the well was frozen; and, Dec. 10, 2009 through Mar. 26, 2010 when the station was closed for the winter. There were four instrument corrections made to the shaft encoder ranging from -0.01 to +0.01 feet. These corrections were prorated by time from previous visit. There was one flush correction, which was prorated from last point of inflection.

Datum Corrections.-- Levels were run Aug. 25, 2010 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable limits, so a correction was not required or made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13 and Aug. 26, 2010, and no adjustments were needed or made.

Rating.-- Control is a cobblestone riffle approximately fifty feet below the gage. Rating No. 17 was used again this year. The rating is fairly well defined from 5 cfs to approximately 1300 cfs. Seventeen measurements (Nos. 183-199) were made this year ranging in discharge from 12.2 to 550 cfs. The measurements cover the discharge range experienced except for the lower daily flow on Dec. 4, 2009 and higher daily flows on May 21-24, 27-31, and June 1, 5-8, 2010. The peak flow of 1170 cfs occurred at 0000 on May 29, 2010 at a gage height of 3.41 ft. with a shift of -0.02 ft. The maximum gage height of 3.41 ft. exceeded high measurement No. 192 (GH=2.61 ft.) made on May 21, 2010 by 0.80 ft. in stage.

Discharge.-- Shifting control method was used for all open water periods. A shift curve (ALATERVS1001) was used from Mar. 26 until May 23, then shift curve (ALATERVS1002) was used from May 23 until Sep. 30, 2010. The upper end of both shift curves were tied back to the rating using measurement No. 111, made May 23, 2005. Open water measurements show shifts varied between -0.15 and +0.02 ft. All were given full weight except Nos. 193, 195, and 199 which were adjusted by as much as 5% to better fit shift curve.

Special Computations.-- Discharge for periods of no gage-height and ice affected record were estimated using five measurements, weather records, partial day record, and comparison with Terrace Reservoir gain and outflow.

Remarks.-- Record is good except for periods of no gage-height and ice-affected record, which are fair to poor. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR

RATING TABLE-- ALATERCO17 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

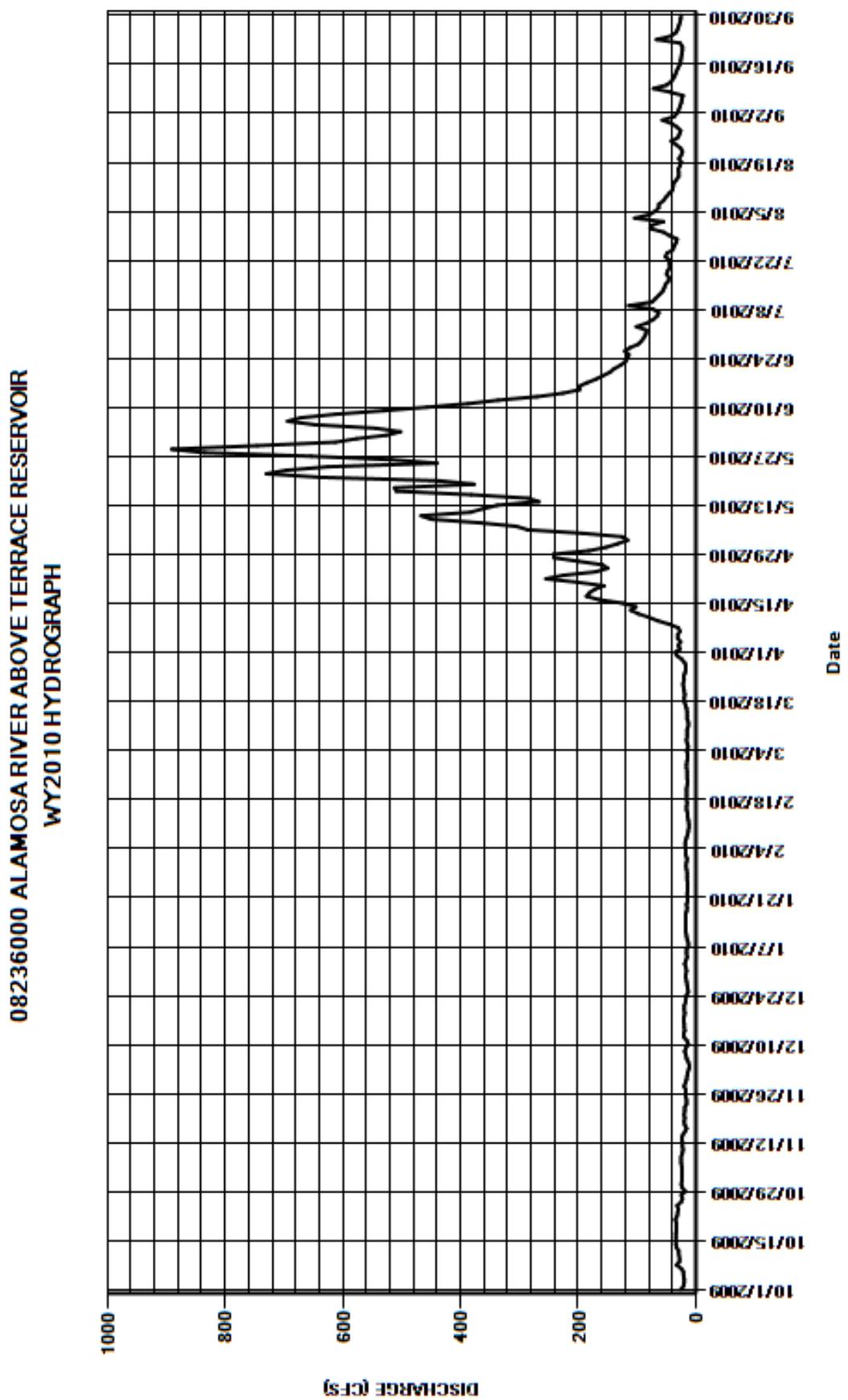
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	24	15	17	15	15	35	153	577	85	75	37
2	21	24	14	19	17	14	27	133	526	84	55	32
3	20	24	12	17	17	14	30	116	502	101	104	29
4	20	24	11	15	18	16	26	125	544	84	79	27
5	21	24	13	16	18	13	31	192	647	73	69	25
6	21	25	16	16	18	15	31	286	694	66	63	24
7	25	25	17	13	16	16	27	306	671	63	63	22
8	33	25	19	13	14	15	30	368	612	73	55	44
9	28	23	17	15	13	15	45	450	531	114	51	72
10	28	22	13	16	12	15	65	467	457	75	46	50
11	29	23	15	17	12	13	80	383	387	69	40	42
12	29	23	20	17	13	13	98	362	336	63	39	38
13	33	24	21	17	14	15	111	338	270	57	38	35
14	34	23	19	17	14	15	102	267	226	54	33	33
15	34	19	20	17	16	15	124	285	198	52	29	30
16	34	16	20	18	16	16	164	382	198	47	29	27
17	34	19	21	16	15	18	186	509	185	46	30	26
18	33	20	20	15	16	20	181	512	170	50	27	25
19	33	19	19	16	16	20	172	377	158	48	25	24
20	33	20	20	14	16	19	156	436	146	44	29	23
21	35	19	20	14	16	20	201	639	139	45	25	23
22	32	19	18	15	15	21	255	730	128	45	23	27
23	31	16	17	14	14	22	225	696	120	52	26	67
24	30	16	16	14	15	20	170	625	116	49	34	42
25	32	17	13	14	15	21	150	440	114	39	42	34
26	25	17	14	15	15	19	159	517	121	37	31	31
27	23	17	15	15	16	17	200	654	112	34	28	29
28	25	20	16	15	16	17	241	835	98	32	26	27
29	18	18	17	16	---	19	242	891	92	45	32	26
30	23	16	17	17	---	24	182	746	88	55	41	25
31	25	---	16	16	---	32	---	613	---	78	57	---
TOTAL	868	621	521	486	428	544	3746	13833	9163	1859	1344	996
MEAN	28	20.7	16.8	15.7	15.3	17.5	125	446	305	60	43.4	33.2
AC-FT	1720	1230	1030	964	849	1080	7430	27440	18170	3690	2670	1980
MAX	35	25	21	19	18	32	255	891	694	114	104	72
MIN	18	16	11	13	12	13	26	116	88	32	23	22
CAL YR	2009	TOTAL	44692	MEAN	122	MAX	1060	MIN	11	AC-FT	88650	
WTR YR	2010	TOTAL	34409	MEAN	94.3	MAX	891	MIN	11	AC-FT	68250	

MAX DISCH: 1170 CFS AT 00:00 ON May. 29,2010 GH 3.41 FT. SHIFT -0.02 FT.

MAX GH: 3.41 FT. AT 00:00 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER BASIN
08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
Water Year 2010

Location.-- Lat. 37°21'20", Long. 106°16'50", UTM X 386855.0, Y 4134774.2, NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T.36 N., R.6 E., Conejos County, Hydrologic Unit 13010002, on left bank 0.5 mi downstream from Terrace Reservoir, 11.0 mi northwest of Capulin, Co.

Drainage and Period of Record.-- 116 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 6-foot square concrete aggregate shelter and 3 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A bank-operated cableway is located 100 feet downstream. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 20, 2009 to Mar. 26, 2010 when the well was frozen.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 23, 2008 to the Reference Point (RP) inside the gage using BM #2 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a gravel and cobblestone riffle approximately one hundred fifty feet below the gage. Rating No. 14 was developed and used this year. This rating was developed from recent measurements made during the 2010 water year along with high flow measurements since the gage was re-located to the current location in 1988. Recent measurements were given more weight which causes this rating to curve slightly to the right as compared with Rating 13 at the upper end. Measurements used range in flow from 1.36 to 951 cfs and range in stage from 1.94 ft to 4.70 ft. The highest measurement at this site since 1988 was measured 5/25/2005 and was used directly to create rating 14. The pzf measured on November 9, 2009, 1.74 ft, was used to define the low point (this same value was measured previously December 4, 2008. The pzf is 0.20 ft greater than rating 13 which indicates filling has occurred in the gage pool. Rating 14 has 10 definition points, 1 breakpoint, and 2 offsets. The high end offset is 2.89 ft which was determined from the best fit offset with some modification to give more weight to recent measurements. The point where the control goes from section to channel control was used for the breakpoint, this occurs at approximately 3.83 ft as determined from measurement notes and observation of best fit. Other definition points were added to smooth the rating curve and prevent reversals from occurring. Rating 14 was extended above the high flow measurement by 0.64 ft to a flow of 1660 cfs at 5.34 ft, 75 percent greater than the highest measurement at this site since 1988. The rating is fairly well defined from 1 to 1000 cfs. Eighteen measurements (Nos. 143 -160) were made this year ranging in discharge from 1.36 to 766 cfs. They cover the discharge range experienced except for higher daily flows May 23,24,30,31, 2010. The peak flow of 994 cfs occurred at 0900 on May 30, 2010 at a gage height of 4.74 ft. with a shift of 0 ft. It exceeded high measurement No. 153 (GH = 4.50), made May 24, 2010, by 0.24 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Measurements show shifts varied between -0.05 and +0.05 ft. All were given full weight and applied except Nos. 150, 152, 154 – 157, and 159 which were adjusted as much as 5%, No. 143, was rated fair and adjusted by 7% and No.144 rated poor and adjusted by 12%.

Special Computations.-- Discharge for periods of no gage-height record was estimated on the basis of, four measurements, partial day records, temperature records, and Terrace Reservoir storage volume. A hydrograph was not used as this station is directly below a reservoir.

Remarks.-- Record is good except for the period of no gage-height record, which is fair. Period of no gage-height record is rated fair, rather than poor, because the gage is directly below a reservoir and gate changes were not made during this period. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR

RATING TABLE--

ALABELCO14 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

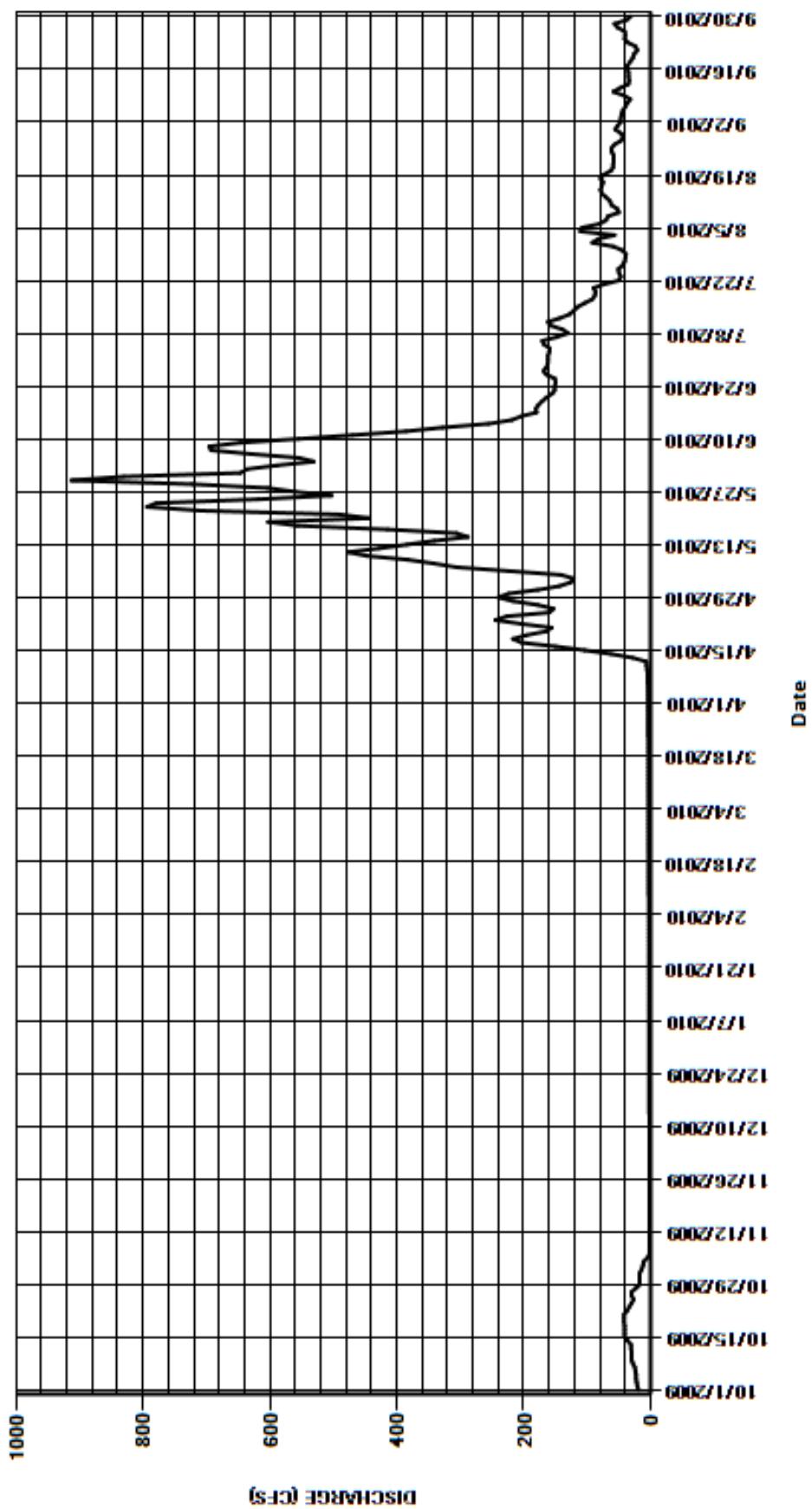
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	17	1.9	2.2	2.7	3.2	3.9	178	647	162	92	52
2	21	14	1.9	2.2	2.7	3.2	3.9	144	636	162	82	47
3	22	12	1.9	2.2	2.8	3.3	3.9	126	589	160	57	47
4	23	11	1.9	2.2	2.8	3.3	4	121	531	159	111	46
5	23	5.4	1.9	2.2	2.8	3.3	4.2	142	555	168	108	44
6	24	1.6	1.9	2.3	2.8	3.3	4.5	223	629	171	80	40
7	25	1.5	2	2.3	2.8	3.3	4.8	306	693	148	70	37
8	28	1.6	2	2.3	2.8	3.3	5	342	696	130	67	32
9	30	1.6	1.9	2.3	2.9	3.4	5.1	383	647	139	50	42
10	30	1.6	1.9	2.3	2.9	3.4	5.6	447	555	157	53	59
11	30	1.6	2	2.3	2.9	3.4	6.7	477	470	162	62	48
12	31	1.6	2	2.4	2.9	3.4	6.9	428	386	143	64	35
13	31	1.6	2.1	2.4	2.9	3.4	28	384	328	128	70	34
14	36	1.6	2.1	2.4	2.9	3.4	62	341	256	121	77	35
15	41	1.6	2.1	2.4	3	3.5	104	288	219	115	79	35
16	41	1.6	2.1	2.4	3	3.5	150	306	204	104	77	36
17	41	1.7	2.1	2.4	3	3.5	203	415	180	92	75	36
18	41	1.7	2.1	2.5	3	3.5	217	557	181	88	79	32
19	42	1.7	2.1	2.5	3	3.5	196	603	177	87	74	28
20	42	1.7	2.1	2.5	3	3.6	165	443	171	90	63	26
21	42	1.7	2.1	2.5	3.1	3.5	156	491	164	73	59	21
22	37	1.7	2.1	2.5	3.1	3.5	204	709	155	50	59	24
23	34	1.7	2.1	2.6	3.1	3.6	245	794	151	47	58	36
24	30	1.7	2.1	2.6	3.1	3.6	227	779	151	50	58	41
25	27	1.9	2.1	2.6	3.1	3.6	160	619	150	51	61	40
26	30	1.9	2.1	2.6	3.1	3.7	153	503	151	44	62	41
27	30	1.9	2.1	2.6	3.2	3.7	178	561	164	41	57	52
28	23	1.9	2.1	2.7	3.2	3.7	216	604	169	40	47	57
29	17	1.9	2.1	2.7	---	3.7	240	723	164	39	43	38
30	17	1.9	2.1	2.7	---	3.8	224	913	162	45	47	31
31	17	---	2.2	2.7	---	3.9	---	831	---	59	56	---
TOTAL	925	101.9	63.2	75.5	82.6	108.0	3186.5	14181	10331	3225	2097	1172
MEAN	29.8	3.4	2.04	2.44	2.95	3.48	106	457	344	104	67.6	39.1
AC-FT	1830	202	125	150	164	214	6320	28130	20490	6400	4160	2320
MAX	42	17	2.2	2.7	3.2	3.9	245	913	696	171	111	59
MIN	17	1.5	1.9	2.2	2.7	3.2	3.9	121	150	39	43	21
CAL YR	2009	TOTAL	44890.2	MEAN	123	MAX	1020	MIN	1.5	AC-FT	89040	
WTR YR	2010	TOTAL	35548.7	MEAN	97.4	MAX	913	MIN	1.5	AC-FT	70510	

MAX DISCH: 994 CFS AT 09:00 ON May. 30,2010 GH 4.74 FT. SHIFT 0 FT.

MAX GH: 4.74 FT. AT 09:00 ON May. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
Water Year 2010

Location.--	Lat. 37°12'32", Long. 106°11'16", UTM X 394552.1, Y 4118707.6, in NE¼ NE¼ sec. 10, T.34 N., R.7 E., Conejos County, Hydrologic Unit 13010002, on left bank 2.7 mi. downstream from Canyon Del Rancho, 7 mi. southwest of Capulin, and 16.5 mi. downstream from La Jara Reservoir.
Drainage and Period of Record.--	98 mi ² .
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping-bucket rain gauge in a 42-inch diameter CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Oct. 27, 29-31, Nov. 1-4, 15-24, 26-30, Dec. 1-14, 2009 and Mar. 27-31, Apr. 1-10, 2010, when the stage-discharge relation was affected by ice; and, Dec. 15, 2009 through Mar. 26, 2010 when the shaft encoder float was affected by ice in oil cylinder. One shaft encoder correction of -0.01 ft. was prorated from 1558 April 13 to 1135 April 15. Three flush corrections were noted on April 19, 27, and May 13, 2010 and prorated back to the last point of deflection.
Datum Corrections.--	Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 23, 2008 to the Reference Point (RP) inside the gage using BM #1 as base. The RP was within allowable limits, so no correction was made.
Rating.--	The control is a concrete broad crested weir with a v-notch cut into its center, approximately 15 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 19, in use since October 1, 2004, was used again this year. It is well defined from 1.7 to 142 cfs. Eighteen measurements (Nos. 143-160) were made this year ranging in discharge from 4.34 to 165 cfs. They cover the discharge range experienced except for higher daily flows on April 13-19, 21, 22, 2010 and the lower estimated daily flows of December 25, 2009 and January 25, 2010. The peak flow of 364 cfs occurred at 0015 on April 18, 2010 at a gage height of 2.90 feet with a shift of +0.12 feet. It exceeded high measurement No. 149 (GH=2.49 feet), made Apr. 13, 2010 by 0.41 feet in stage. Measurement No. 149 was made with trash on the control and resulted in a measured shift of -0.12 feet. Measurement No. 150 was made two days later after removing trash from the control and resulted in a measured shift of +0.12 feet.
Discharge.--	The last shift from WY2009 (+0.01 ft) was continued to measurement 143 on October 22, 2009. The +0.01 ft shift was used until an ice plug formed in the oil cylinder on Dec. 15, 2009. The -0.01 ft. shift measured on March 26, 2010 was applied from that point until April 12, 2010 when large jump in gage height occurred. This rapid jump in gage-height and flow was verified as real by the water commissioner. It is assumed that the trash associated with the -0.12 shift (adjusted to -0.05 ft) measured on April 13 came on to the control during this jump. The -0.05 ft shift was applied from that point to the April 13 measurement. Then the shift was prorated from -0.05 ft. to -0.03 ft. (+0.12 measured shift with a -0.15 ft cleaning correction) at 0200 on April 15 (max gage-height). The -0.03 ft shift was then applied until April 15 at 11:55 when trash was removed from the control before measurement. At 1200 on April 15 a +0.12 ft shift was applied until April 18 at 0015 (max discharge) and then prorated to a +0.05 ft shift (adjusted from +0.01) on April 19. This +0.05 ft shift was then applied until the April 27 measurement, which was adjusted to +0.05 ft from +0.07 ft. The +0.05 ft shift on April 27 was prorated to +0.03 ft shift (adjusted from +0.04 ft) on May 13. The +0.03 ft shift was used for the remainder of the water year. Measured shifts during the water year varied from -0.12 (assume trash on control) to +0.15 feet. All measurements were given full weight, except for Nos. 143, 144, 151-154, 156, 157, and 160, which were adjusted by as much as 5 percent and No. 149, which was adjusted 8% to smooth shift distribution. There were two measurements, Nos. 150 and 151, which resulted in the same flow with a 0.03 ft. difference in gage-height. Measurements No. 151 was adjusted by 4% to equal the shift of measurement No. 150.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using four measurements, and weather records from Alamosa River above Terrace Reservoir site.
Remarks.--	Record is good except for the period from April 11 until May 13, 2010 which is fair due to the uncertainties in shift application (maximum discharge and maximum gage height occurred during this period), and periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN

RATING TABLE--

LAJCAPCO19TMP USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.9	9	7.5	5	4.5	6.5	10	78	54	11	14	7.6
2	9.1	8.3	7	4.5	4.5	7	9	71	53	12	10	7.4
3	8.9	8.3	6.5	5	4.5	7	9.6	56	51	12	9.6	7.7
4	8.9	8.5	6.5	4.5	5	7	10	57	45	11	9.3	7.7
5	8.7	8.9	7.5	5	5.5	6.5	11	59	44	11	9.5	7.4
6	8.9	9.2	8	5	5.5	7	11	62	42	11	9.5	7.1
7	9.4	9.7	8	5	5.5	7	10	67	41	11	9.1	7.1
8	10	9.5	7	4.5	6	6.5	11	67	40	11	9.9	8.2
9	9.7	8.5	6.5	4.5	6	6	17	73	40	13	11	8.7
10	9.3	8	6.5	5	6	6	17	82	33	12	9.3	7.6
11	8.9	8.1	7	5.5	6	6.5	43	82	31	11	8.7	7.5
12	8.7	8	7	5.5	6	7	74	67	31	11	8.8	7.5
13	9.8	8.2	7.5	5.5	6	6.5	222	61	31	10	8.8	7.4
14	11	8.2	6.5	6	5.5	6	172	57	30	10	8.3	7.4
15	9.6	8	6	5.5	5	6.5	222	53	32	10	8.3	7.2
16	8.5	7.5	6	5.5	5.5	7	225	55	30	9.3	8.6	7.1
17	7.3	7.5	6.5	5.5	6	8	272	51	22	9.7	9.6	7.1
18	7.1	8	6.5	5.5	6	8.5	232	50	21	11	8.8	7.2
19	7.1	8.5	6	5.5	6	8	178	47	20	10	8.5	7.2
20	7.1	8.5	6	5.5	5.5	7.5	146	44	20	13	8.6	7.3
21	10	8.5	6	5	5	7	189	39	20	12	8	7.5
22	9.4	8.5	6.5	5.5	5	8	208	37	19	10	7.8	8.4
23	9	8.5	6.5	5	5	8	149	35	19	11	8.6	10
24	9.5	6.5	5	4.5	5.5	8	108	33	15	11	8.6	8.4
25	9.8	5.5	4	4	5.5	7.5	103	33	14	11	8	8
26	8.6	6	4.5	4.5	5	7	108	56	14	10	7.9	7.9
27	8.1	6.5	5	5	5.5	7	108	57	14	9.5	7.7	7.9
28	8.6	7	5	5.5	6	6.8	111	57	14	9.3	7.8	7.8
29	7	7.5	5	5.5	---	9	113	57	14	10	8.2	7.8
30	8	7.5	5	5.5	---	10	83	56	12	10	8.2	7.8
31	8	---	4.5	5	---	10	---	55	---	19	8	---
TOTAL	273.9	240.4	193.0	158.5	153.0	226.3	3181.6	1754	866	342.8	277.0	230.9
MEAN	8.84	8.01	6.23	5.11	5.46	7.3	106	56.6	28.9	11.1	8.94	7.7
AC-FT	543	477	383	314	303	449	6310	3480	1720	680	549	458
MAX	11	9.7	8	6	6	10	272	82	54	19	14	10
MIN	7	5.5	4	4	4.5	6	9	33	12	9.3	7.7	7.1

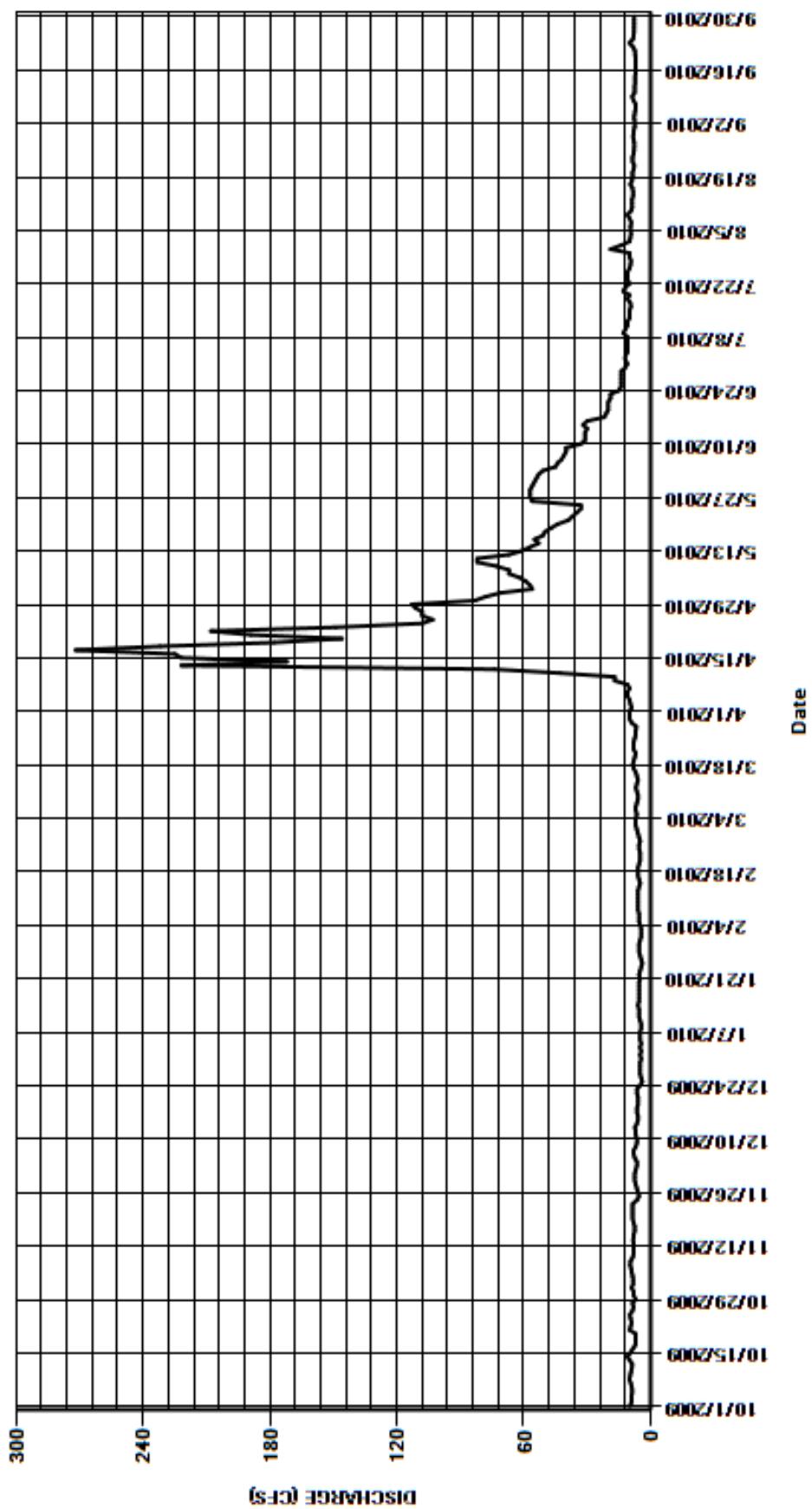
CAL YR	2009	TOTAL	8070.1	MEAN	22.1	MAX	137	MIN	4	AC-FT	16010
WTR YR	2010	TOTAL	7897.4	MEAN	21.6	MAX	272	MIN	4	AC-FT	15660

MAX DISCH: 364 CFS AT 00:15 ON Apr. 18,2010 GH 2.9 FT. SHIFT 0.12 FT.

MAX GH: 3 FT. AT 02:00 ON Apr. 15,2010 (Trash on control)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
Water Year 2010

Location.--	Lat. 37°17'55", Long. 105°53'49", UTM X 424251.0, Y 4128328.0, SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T.35 N., R.10 E., Conejos County, Hydrologic Unit 13100002, on right bank of channel approximately 150 ft. north of road, 13 miles south of Alamosa, 7 miles northwest of LaSause.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a steel shelter and a 24 inch diameter CMP well at a three foot Parshall Flume, which was modified by inserting a steel V-ramp on Aug. 16, 2010. The primary reference gage is drop tape from a mark chiseled in the shelf support frame. The secondary reference is outside staff gage in flume. The Sutron Satlink Logger was replaced with a Satlink2 on Aug. 19, 2010.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for the following periods: Nov. 15-30, Dec. 1-3, 2009 and Mar. 19-25, April 1-3, 2010, when the stage-discharge relation was affected by ice; Dec. 4-17, 2009 when the well was frozen; Dec. 18, 2009 through Mar. 17, 2010, when station was closed for the winter; Oct. 1-7, 13, 2009, when gage was isolated for all or portions of the day. There were three corrections made to shaft encoder; a +0.01 ft on Oct. 30, 2009, a -0.01 ft on Jul. 9, 2010, and a +0.01 ft on Jul. 28, 2010. All were prorated from previous visit. There were two flume cleaning corrections; a -0.02 ft on Jun. 17, 2010, and a +0.01 ft on Oct. 20, 2010 (WY 2011). Both were prorated from previous visit.
Datum Corrections.--	The Parshall flume was last inspected with levels completed two years ago on July 30, 2008. The flume is in poor condition. The levels, as well as this year's record, indicate considerable lateral slope away from well on REW and downward toward staff on LEW.
Rating.--	Control is a three-foot Parshall Flume. Shifting is caused by the unlevel flume, and also sand and aquatic plant growth accumulating in front of and in the flume. A steel insert was placed in the throat of the flume on August 16, 2010 to prevent the flume from isolating. Rating No. 1, used since Aug. 3, 1989, was used again this year. It is a standard three foot Parshall Flume rating table. Eighteen measurements (Nos. 319-336) were made this year ranging in discharge from 0.43 to 19.2 cfs. They cover the discharge range experienced except for the lower daily flows on September 14-20, 25, 26, 28-30, 2010. The peak flow of 32.8 cfs occurred at 1800 on Nov. 5, 2009 at a gage height of 1.85 ft. with a shift of 0.05 ft. It exceeded high Meas. No. 329 (GH = 1.35), made May 25, 2010, by 0.50 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts ranged from +0.08 to 0 ft. prior to the flume modification being installed on Aug. 16, 2010. After the flume was modified, measured shifts ranged from -0.17 ft. to -0.20 ft. All were given full weight and applied, except No. 319, which was adjusted 4% and Nos. 335 and 336, which were adjusted by as much as 18% to smooth shift distribution. Measurement Nos. 335 and 336 were rated poor due to very low flow conditions.
Special Computations.--	Discharge for periods of winter no gage-height and ice affected record was estimated on the basis of five measurements, partial record days, weather records, and comparison with the station "Norton Drain near LaSause". Discharge for periods of no gage-height record due to gage isolation was estimated using one measurement and comparison with the hydrograph from "Norton Drain near LaSause". A hydrograph was used.
Remarks.--	Record is good except for periods of no gage-height, ice affected record, and the period from August 16 to September 30, 2010 (after flume was modified) which are poor. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars .
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES

RATING TABLE--

NORDSCCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.1	3.8	2.2	1	0.6	2.6	3	6.9	12	3.7	2.6	0.65
2	1.1	3.7	2	1	0.6	2.8	2.5	7.7	12	3.4	4	0.59
3	1.1	3.8	1.8	1	0.6	2.8	2.9	7.8	11	3.3	4.3	0.45
4	1.2	3.5	1.8	1	0.6	2.8	2.8	7.4	13	3.1	4.4	0.69
5	1.2	11	1.8	1	0.6	2.8	2.4	6	13	3.3	3.7	0.96
6	1.1	6.2	1.8	1	0.6	2.8	2.2	5.9	14	3.1	4.2	0.65
7	1.2	4.8	2	1	0.6	3	2.2	9.9	15	2.8	3.2	0.57
8	1.3	4.4	2	1	0.8	3	1.4	11	14	2.7	2.9	0.61
9	1.4	4.8	1.8	0.8	0.8	3	1.3	8.6	15	2.8	2.7	0.62
10	1.4	4	1.6	0.8	0.8	3	1.3	8.5	11	2.6	2.8	0.61
11	1.4	3.7	1.6	1	0.8	3	1.3	8.2	8.7	2.6	2.6	0.61
12	1.4	3.5	1.8	1	0.8	3.2	1.4	8.9	8.3	2.6	2.3	0.5
13	1.2	3.3	2	0.8	0.8	3.4	1.4	8.6	6.3	2.8	2.2	0.51
14	1.5	3.1	2	0.8	0.8	4.2	1.5	9	5.7	2.6	1.9	0.41
15	1.4	3	1.8	0.8	0.8	4.6	1.5	10	4.9	2.4	1.8	0.39
16	1.4	3.2	1.8	0.8	0.8	4.6	1.5	11	4.8	2.2	1.7	0.34
17	1.4	3.2	1.8	0.8	0.8	4.6	3.3	9.1	4.3	2	1.6	0.39
18	1.8	3.2	1.8	0.8	1.2	4.2	4.8	9.9	4.2	1.9	1.4	0.31
19	1.8	3.2	1.8	0.8	1.2	3.2	4.1	7.7	4	1.9	1.3	0.31
20	2.1	3.2	2	0.8	1.4	3.8	3.7	7.6	3.9	2	1.2	0.36
21	3	3	2	0.8	1.4	3.6	3.5	8.5	3.6	2.7	1.1	0.9
22	2.8	3	1.8	0.8	1.4	3.3	3.1	10	3.4	2.1	1	0.86
23	2.7	2.8	1.6	0.8	1.4	3.3	4.2	16	3.2	2.1	1	0.59
24	3.1	2.6	1.4	0.8	1.4	3.4	3.3	12	3.1	2.6	0.98	0.57
25	3.6	2.6	1.2	0.6	1.4	3.2	3.3	19	3.2	4.9	0.99	0.36
26	2.9	2.6	1	0.6	1.6	3.5	3.2	17	4.4	5.3	1.1	0.39
27	3.3	2.6	1	0.6	1.8	3.3	3.3	13	4.7	4.1	1.1	0.43
28	5.8	2.6	1	0.8	2.2	3.2	4	12	4.1	3.4	0.99	0.32
29	7.5	2.6	1	0.8	---	3.4	4.8	11	3.9	2.9	0.89	0.28
30	7.1	2.4	1	0.8	---	3.4	7.6	14	3.8	2.6	0.78	0.28
31	5.9	---	1	0.6	---	3.1	---	14	---	2.6	0.72	---
TOTAL	75.2	109.4	51.2	26.00	28.60	104.1	86.8	316.2	222.5	89.1	63.45	15.51
MEAN	2.43	3.65	1.65	0.84	1.02	3.36	2.89	10.2	7.42	2.87	2.05	0.52
AC-FT	149	217	102	52	57	206	172	627	441	177	126	31
MAX	7.5	11	2.2	1	2.2	4.6	7.6	19	15	5.3	4.4	0.96
MIN	1.1	2.4	1	0.6	0.6	2.6	1.3	5.9	3.1	1.9	0.72	0.28

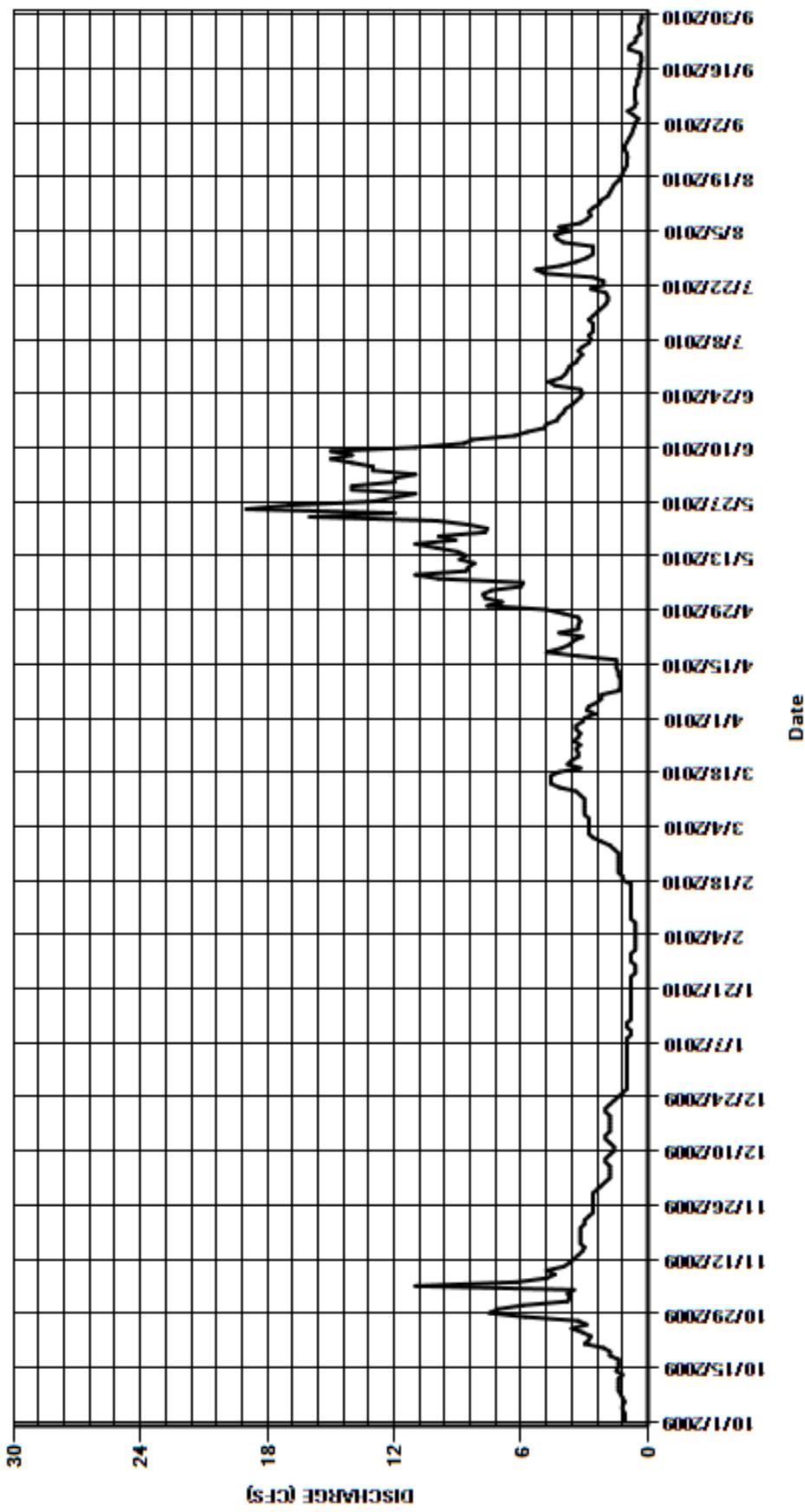
CAL YR	2009	TOTAL	1580.90	MEAN	4.33	MAX	30	MIN	0.1	AC-FT	3140
WTR YR	2010	TOTAL	1188.06	MEAN	3.25	MAX	19	MIN	0.28	AC-FT	2360

MAX DISCH: 32.8 CFS AT 18:00 ON Nov. 05,2009 GH 1.85 FT. SHIFT 0.05 FT.

MAX GH: 1.85 FT. AT 18:00 ON Nov. 05,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTON DRAIN NEAR LA SAUSES

Water Year 2010

Location.-- Lat. 37°20'10", Long. 105°46'13", UTM X 432032.9, Y 4132127.3, SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, T.36 N., R.11 E., Conejos County, Hydrologic Unit 13010002, on left bank of channel, 1 1/2 miles above confluence with Rio Grande River, 11 miles south of Alamosa, 5 miles North of LaSause.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a 36 inch diameter CMP shelter and well at a modified six-foot Parshall Flume. The primary reference gage is drop tape from an inside reference point. The secondary reference is outside staff gage in flume. No changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Oct. 26, 27, 30, Nov. 15-30, Dec. 1, 2, 2009 and Mar. 18-25, Apr. 2, 3, 6-8, 2010, when the stage-discharge relation was affected by ice; Dec. 3 - 9, 2009, when the well was frozen and Dec. 10, 2009 – Mar. 17, 2010 when the station was closed for the winter. The ramp inserts at the throat of the flume where lifted by ice on Mar. 17, 2010 causing an elevated gage height during the period from Mar. 17 until Apr. 13, 2010. There were three corrections made to the shaft encoder; a -0.02 ft on May 5, a +0.02 ft on Jul. 9, and a -0.01 ft on Sep. 7, 2010. All were prorated by time from previous visit. There was also a cleaning correction of -0.04 ft on Jun. 17, 2010, which was prorated from previous visit.

Datum Corrections.-- Inspection and levels were last completed on the flume July 30, 2008. The flume is in good condition. Since this Parshall Flume has been modified with ramp inserts at the throat, it is not expected to perform as a Parshall flume.

Rating.-- The permanent control for the water year was the modified six-foot Parshall Flume. Rating No. 04T1 was created June 18, 2008 and used since January 1, 2008 until Sep. 1 2010 when rating 05a was put into use. Rating 05a is intended to better define the very low end of the curve. Shifting is caused by sand and moss accumulating in front of and in the flume. Sixteen measurements (Nos. 737-752) were made this year ranging in discharge from 0.17 to 16.7 cfs. The measurements cover the flow range experienced except for higher daily flows on May 23-28, 30, 31, Jun. 2, 5-7, 9, 2010 and the lower daily flows on Sep. 15-21, 28-30, 2010. The peak flow of 34.3 cfs occurred at 2045 on Nov. 5, 2009 at a gage height of 1.26 feet with a shift of 0 feet (Rating No. 04T1). It exceeded high measurement No. 747 (GH = 0.86), made May 25, 2010 by 0.40 feet in stage.

Discharge.-- Shifting control method was used for all periods of good record. A variable shift curve, NORDLVS1001, was used to define the stage-shift relation from Oct. 1 to Dec. 10, 2009. Another variable shift curve, NORDLVS1002, was used to define the stage-shift relation from April 13 to Jul. 28, 2010. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts ranged from -0.01 to +0.04 feet during the period when rating NORDLSCO04T1 was used and a 0 shift measured when using rating NORDLSCO04a. All measurements were given full weight and applied except Nos. 739, 746, and 748 which were adjusted as much as 5% to smooth shift distribution. The ramp inserts at the throat of the flume where lifted by ice on Mar. 17, 2010 causing an elevated gage height during the period from Mar. 17 until Apr. 13, 2010. Based on measurement No. 745 a shift of -0.36 ft. was used during this period.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using seven measurements, partial record days, weather records, and comparison with the station "South Channel Norton Drain near LaSause". A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, and the period from Mar. 17 – Apr. 13, 2010, when gage-height was elevated due to ramp inserts being out of place, which are poor. The low-flow period from Aug. 31 to Sep. 30, 2010 should also be considered poor since the rating is inadequately defined within this low range. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTON DRAIN NEAR LA SAUSES

RATING TABLE--

NORDLSCO04T1 USED FROM 01-Oct-2009 TO 01-Sep-2010
NORDLSCO05a USED FROM 01-Sep-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

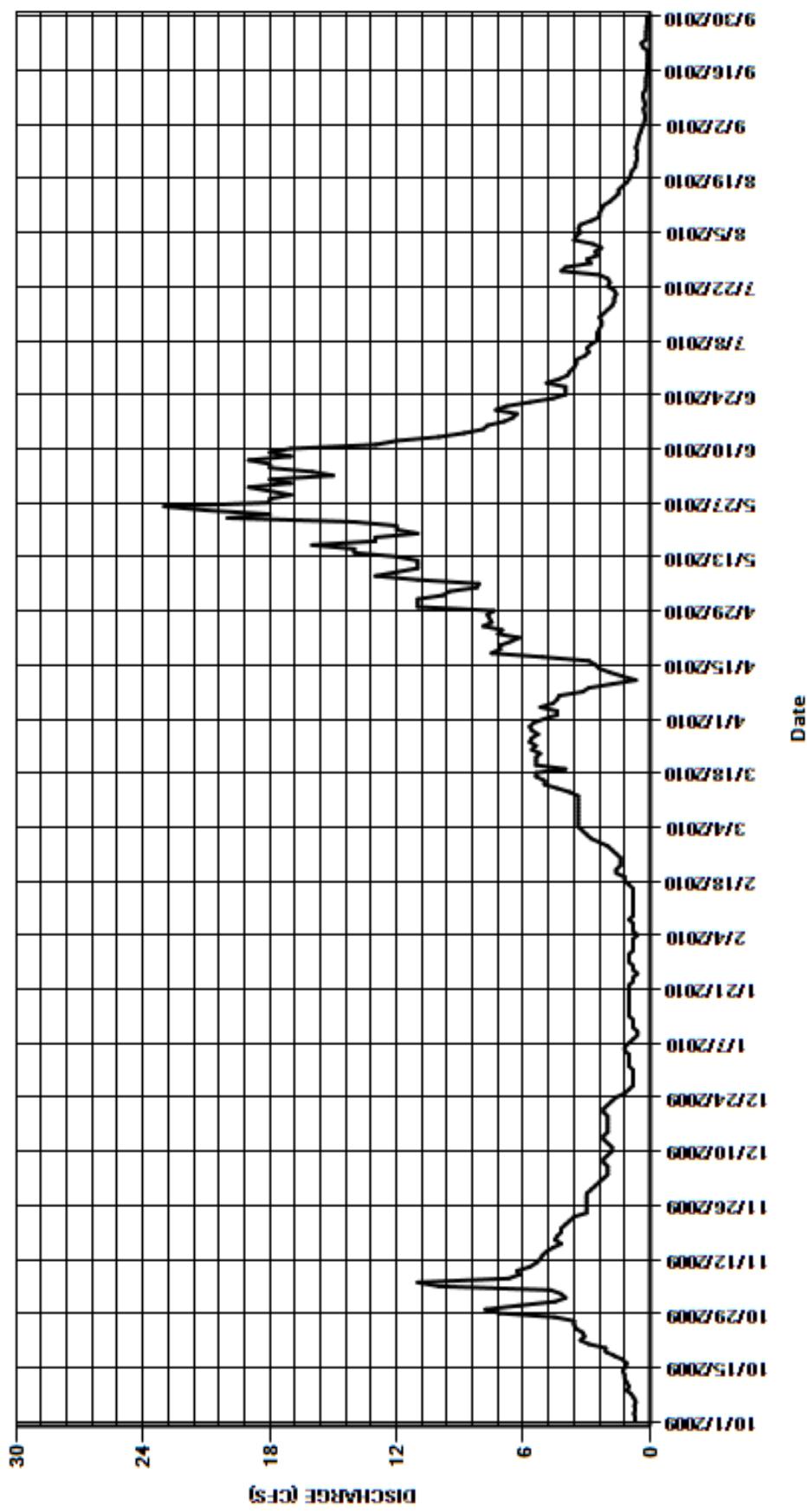
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.7	4.5	2.6	1	0.8	2.8	5	11	17	3.6	2.3	0.39
2	0.71	4	2.4	1	0.8	3	4.4	11	18	3.5	2.7	0.3
3	0.76	4.2	2.2	1	0.8	3.2	4.4	9.8	15	3.5	3.6	0.26
4	0.7	4.7	2	1	0.6	3.4	5.2	9.5	16	3.1	3.5	0.23
5	0.74	10	2	1.2	0.8	3.4	4.6	8.2	18	2.9	3.3	0.27
6	0.68	11	2	1.2	0.8	3.4	4.4	8.1	18	3	3.4	0.31
7	0.76	6.7	2.2	1	0.8	3.4	4.3	11	19	2.8	3.3	0.23
8	0.88	6.2	2.2	0.8	1	3.4	3.2	13	17	2.5	2.8	0.28
9	1.1	6.3	2	0.6	0.8	3.4	2.9	12	18	2.5	2.4	0.33
10	1	5.7	1.8	0.6	0.8	3.4	1.8	11	17	2.5	2.4	0.33
11	1.1	5.4	1.8	0.8	0.8	3.4	0.67	11	13	2.4	2.3	0.22
12	1.2	5.2	2	0.8	0.8	3.4	1.3	11	12	2.3	2.2	0.19
13	1.2	5.1	2.2	0.8	0.8	3.8	1.9	12	10	2.3	1.9	0.2
14	1.3	4.9	2.2	1	0.8	4.4	2.4	14	8.8	2.4	1.7	0.19
15	1.2	4.6	2	1	0.8	5	2.6	14	7.9	2.2	1.5	0.16
16	1.1	4.2	2	1	0.8	5	2.9	16	7.7	2	1.5	0.15
17	1.3	4.5	2	1	1	5.4	5.1	13	6.9	1.8	1.3	0.15
18	1.7	4.4	2	1	1.2	5.4	7.5	13	6.5	1.7	1.1	0.13
19	2.1	4.2	2	1	1.2	4	7.1	11	6.3	1.7	0.97	0.13
20	2.1	4.2	2.2	1	1.6	5.4	7.1	12	7.3	1.6	0.92	0.12
21	2.9	4	2.2	1	1.6	5.4	6.6	12	6.8	1.7	0.85	0.12
22	3.3	3.8	2	1	1.4	5.4	6.2	14	5.7	2	0.69	0.34
23	3.1	3.6	1.8	0.8	1.4	5.2	7.2	20	4.6	1.9	0.68	0.41
24	3.2	3	1.6	0.8	1.4	5.6	7	18	4	2	0.62	0.18
25	3.5	3	1.2	0.6	1.6	5.4	7.9	21	4	2.4	0.64	0.19
26	3.6	3	1	0.8	1.8	5.7	7.5	23	4	4.2	0.62	0.19
27	3.6	3	0.8	0.8	2	5.6	7.6	18	4.9	4	0.68	0.17
28	4.5	3	0.8	1	2.4	5.3	7.7	18	4.3	2.8	0.6	0.16
29	7.1	3	0.8	1	---	5.6	7.4	17	3.9	3	0.57	0.15
30	7.8	2.8	0.8	1	---	5.7	11	18	3.8	2.5	0.52	0.15
31	6.2	---	0.8	0.8	---	5.5	---	19	---	2.6	0.45	---
TOTAL	71.13	142.2	55.60	28.40	31.40	138.4	154.87	429.6	305.4	79.4	52.01	6.63
MEAN	2.29	4.74	1.79	0.92	1.12	4.46	5.16	13.9	10.2	2.56	1.68	0.22
AC-FT	141	282	110	56	62	275	307	852	606	157	103	13
MAX	7.8	11	2.6	1.2	2.4	5.7	11	23	19	4.2	3.6	0.41
MIN	0.68	2.8	0.8	0.6	0.6	2.8	0.67	8.1	3.8	1.6	0.45	0.12
CAL YR	2009	TOTAL	2382.77	MEAN	6.53	MAX	41	MIN	0.62	AC-FT	4730	
WTR YR	2010	TOTAL	1495.04	MEAN	4.1	MAX	23	MIN	0.12	AC-FT	2970	

MAX DISCH: 34.3 CFS AT 20:45 ON Nov. 05,2009 GH 1.26 FT. SHIFT 0 FT.

MAX GH: 1.33 FT. AT 10:45 ON Apr. 02,2010 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTON DRAIN NEAR LA SAUSSES
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES
Water Year 2010

Location.-- Lat. 37°18'58", Long. 105°44'32", UTM X 434183.1, Y 4130200.1, in sec. 35, T.36 N., R.II E., Conejos County, Hydrologic Unit 13010002, on right bank 0.2 mi upstream from the historical channel of Trinchera Creek, 3.2 mi north of Lasauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- Approximately 5,740 mi², includes 2,940 mi² in closed basin in northern part of San Luis Valley, Co. May 1936 to current year. Water quality data from 1993 to 1996.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 7 ft. by 7 ft. exposed aggregate building with 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. The satellite system was upgraded to a Sutron Satlink2 and SDR on Aug. 19, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except, Nov. 24 - Dec. 1, 2009, when the stage-discharge relation was affected by ice; Dec. 2, 2009 through Mar. 17, 2010, when well was frozen; and May 22-25, and Aug. 13-16, 2010 when the inlets were temporarily plugging and naturally flushing. There was one shaft encoder correction of +0.01 ft on Nov. 19, 2009, which was prorated by time from previous visit. There were also two flush corrections, a -0.04 ft on May 5, 2010, which was prorated by time from previous inflection point and a -0.05 ft which was not distributed due to 'a' record.

Datum Corrections.-- Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage on Jul. 28, 2009 using B.M. No. 2 as base. The RP elevation was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a sand streambed and channel. The sand movement causes numerous shift changes. Rating No. 12 was used this year. Thirteen measurements (Nos. 215-227) were made this year ranging in discharge from 36.1 to 348 cfs. They cover the discharge range experienced except for the lower daily flows of Oct. 1, 2, 5, 6, 2009, Aug. 1, 6, 7, 9-14, 29-31, Sep. 1, 5-7, 9, 10, 14, 15, 17-24, 2010; and the higher daily flows of Mar. 12, 16-31, Apr. 1-6, May 29-31, Jun. 4-17, 2010. The peak flow of 737 cfs occurred at 1945 on Apr. 2, 2010 at a gage height of 4.09 ft. with a shift of 0.12 ft. It exceeded high measurement No. 222 (GH = 3.16 ft.) by 0.93 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time. This year's measurements showed shifts varied between -0.20 and +0.12 ft. All shifts were given full weight and applied except for Nos. 215-217, 223, 226, and 227, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated using comparison with nearby stations with a river accounting sheet. Discharge for periods of no gage height due to inlets temporarily plugging and flushing was estimated using gage-height trend associated with gage-height at natural flushes.

Remarks.-- Record is good except for periods of no gage-height and ice affected records, which are poor; and periods of higher daily flows including Mar. 18 – Apr. 6, and Jun. 4-16, 2010, including the peak discharge should be considered fair to poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES

RATING TABLE--

RIOTRICO12 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

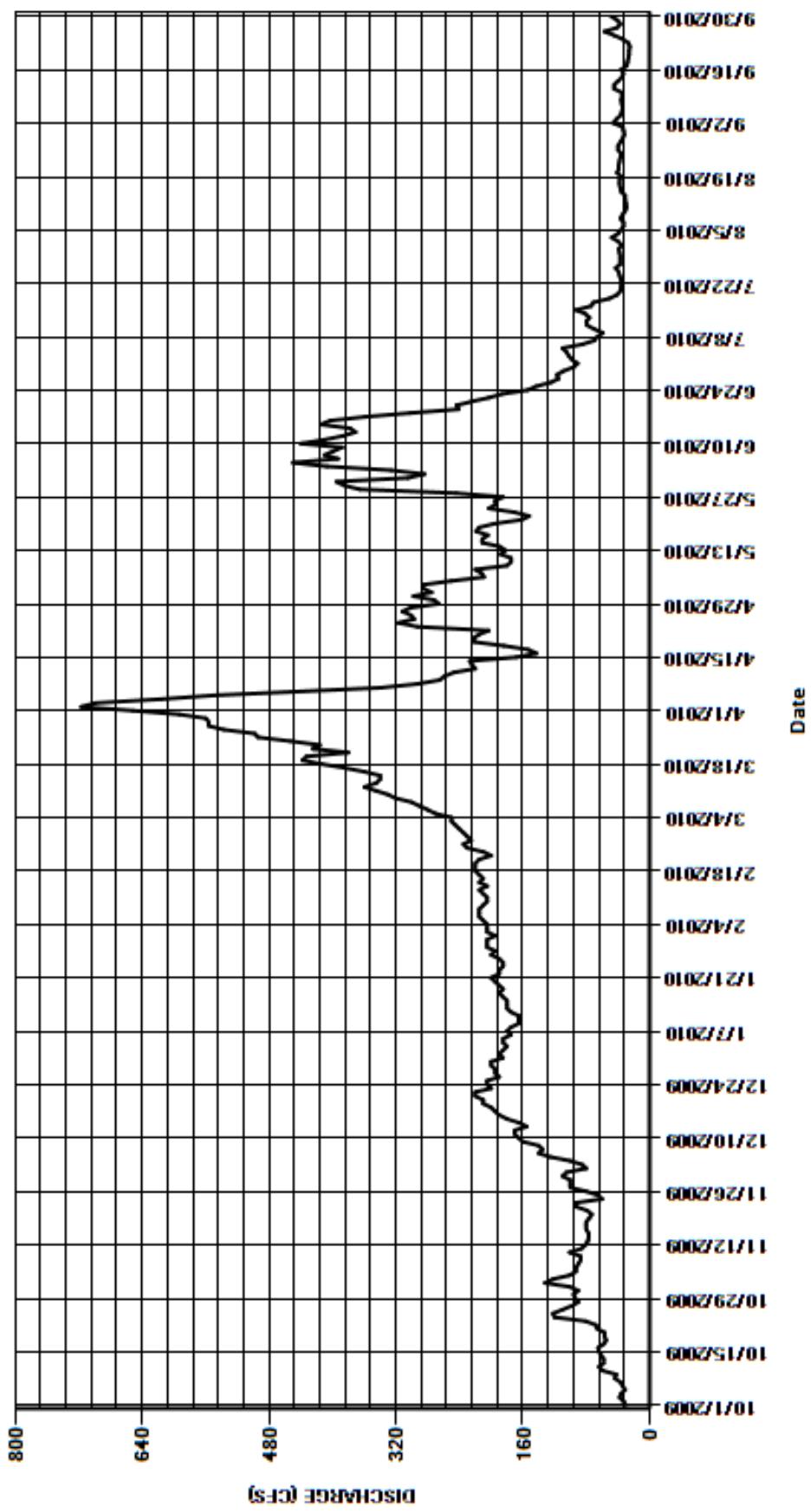
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	101	105	190	195	240	652	298	305	91	35	34
2	33	132	80	185	205	245	717	275	284	98	40	46
3	38	122	85	180	205	250	699	286	326	102	48	42
4	36	101	100	185	205	250	616	285	407	105	40	37
5	31	93	125	185	210	270	550	250	450	110	36	35
6	34	93	140	175	215	280	445	209	393	85	33	34
7	37	90	135	180	215	290	339	212	410	70	33	35
8	44	87	140	175	215	300	293	220	399	66	37	36
9	42	87	160	165	210	320	265	180	388	59	34	35
10	59	101	165	165	205	330	259	175	440	70	31	35
11	64	86	170	165	205	345	247	175	410	79	29	45
12	58	81	170	175	210	360	220	188	387	80	30	45
13	58	78	155	180	215	345	224	182	371	76	31	40
14	61	77	165	180	205	340	227	189	378	81	31	35
15	64	77	180	180	215	340	168	211	415	93	36	33
16	65	80	190	185	210	360	143	211	403	74	37	36
17	58	80	195	190	215	385	153	204	359	71	38	29
18	55	80	200	185	220	414	184	219	302	51	38	28
19	57	76	210	190	220	438	221	215	241	41	36	27
20	57	73	210	195	220	433	222	196	244	37	41	26
21	66	79	220	200	215	380	215	162	225	36	39	26
22	68	93	220	190	200	425	203	152	203	36	39	25
23	81	93	200	190	210	416	293	171	186	36	38	27
24	120	60	205	185	230	453	317	203	154	38	37	34
25	122	65	205	185	235	494	297	194	143	39	36	45
26	110	80	190	190	225	498	301	195	125	43	40	57
27	98	100	195	200	230	537	312	185	115	37	40	41
28	90	100	195	195	235	556	301	244	117	37	37	37
29	94	100	200	205	---	556	266	366	109	37	34	41
30	96	110	200	205	---	560	272	385	96	38	32	49
31	90	---	185	205	---	593	---	395	---	39	33	---
TOTAL	2016	2675	5295	5760	5995	12003	9621	7032	8785	1955	1119	1095
MEAN	65	89.2	171	186	214	387	321	227	293	63.1	36.1	36.5
AC-FT	4000	5310	10500	11420	11890	23810	19080	13950	17430	3880	2220	2170
MAX	122	132	220	205	235	593	717	395	450	110	48	57
MIN	30	60	80	165	195	240	143	152	96	36	29	25
CAL YR	2009	TOTAL	75004	MEAN	205	MAX	793	MIN	26	AC-FT	148800	
WTR YR	2010	TOTAL	63351	MEAN	174	MAX	717	MIN	25	AC-FT	125700	

MAX DISCH: 737 CFS AT 19:45 ON Apr 02,2010 GH 4.09 FT. SHIFT 0.12 FT.

MAX GH: 4.09 FT. AT 19:45 ON Apr 02,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSSES
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH
Water Year 2010

Location.-- Lat. 37°22'16", Long. 105°17'05", UTM X 473880.5, Y 4136484.8, Costilla County, Hydrologic Unit 13010002, in Sangre de Cristo Grant, on right bank 0.9 mi downstream from North Fork, 1.0 mi upstream from Turners Ranch, and 8.3 mi southeast of Fort Garland.

Drainage and Period of Record.-- 45 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 6 ft. by 6 ft. exposed aggregate shelter and 3 ft. concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A tipping bucket rain gage and air temperature sensor were installed on Sep. 1, 2009. The 8210 DCP was replaced with a Sutron Satlink2 on Aug. 18, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except Oct. 7, 8, 2009 when inlets were closed; Oct. 26, 27, 30, 31, Nov. 1, 16-30, Dec. 1-13, 25-27, 2009, Mar. 18-29, Apr. 2-4, 7-10, 2010, when the stage-discharge relation was affected by ice; and, Dec. 28, 2009 through Mar. 17, 2010 when inlets were plugged and/or frozen. There was one instrument correction of -0.01 ft made to the shaft encoder on Apr. 14, 2010, which was prorated from previous visit. There was a +0.01 ft trash correction due to debris on inlets on 5/5/2010, which was prorated from previous visit. There was also a -0.02 ft gage-height correction due to levels correction ran straight from Mar. 17 to Aug. 26, 2010.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on August 26, 2010 using R.M. No. 4 as base. The RP was 0.024 ft low, so the tape length was shortened by 0.02 ft, which re-established the RP elevation from 12.670 to 12.646 ft. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a small rock weir approximately 10 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials in and above gage-pool. Rating No. 14, in use since Oct. 1, 2006, was used again this year. Measured shifts are trending more positive over time due to deposition above gage-pool increasing slope and velocity. Seventeen measurements (Nos. 173-189) were made this year ranging in discharge from 6.95 to 94.1 cfs. They cover the discharge range experienced except for higher daily flows on May 29-31, Jun. 1, 7, 2010; and lower daily flows on Nov. 16, Dec. 10, 11, 19, 20, 26-31, 2009, Jan. 1-5, 8-13, 25, 26, Feb. 1, 2, 23-28, Mar. 11-16, 19-22, 24-27, 2010. The peak flow of 122 cfs occurred at 1815 on Jul. 8, 2010 at a gage height of 4.46 ft. (GH corr. -0.02 ft applied) with a shift of +0.05 ft. It exceeded high measurement No. 183 (GH=4.29 ft.) by 0.17 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Measurements show shifts varied between 0.00 and +0.06 ft. All measurements were given full weight except Nos. 174, 176, 182, and 185, which were adjusted by as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record were estimated using five measurements, comparison with nearby station (TRIMTNCO), and weather records. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH

RATING TABLE--

TRITURCO14 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

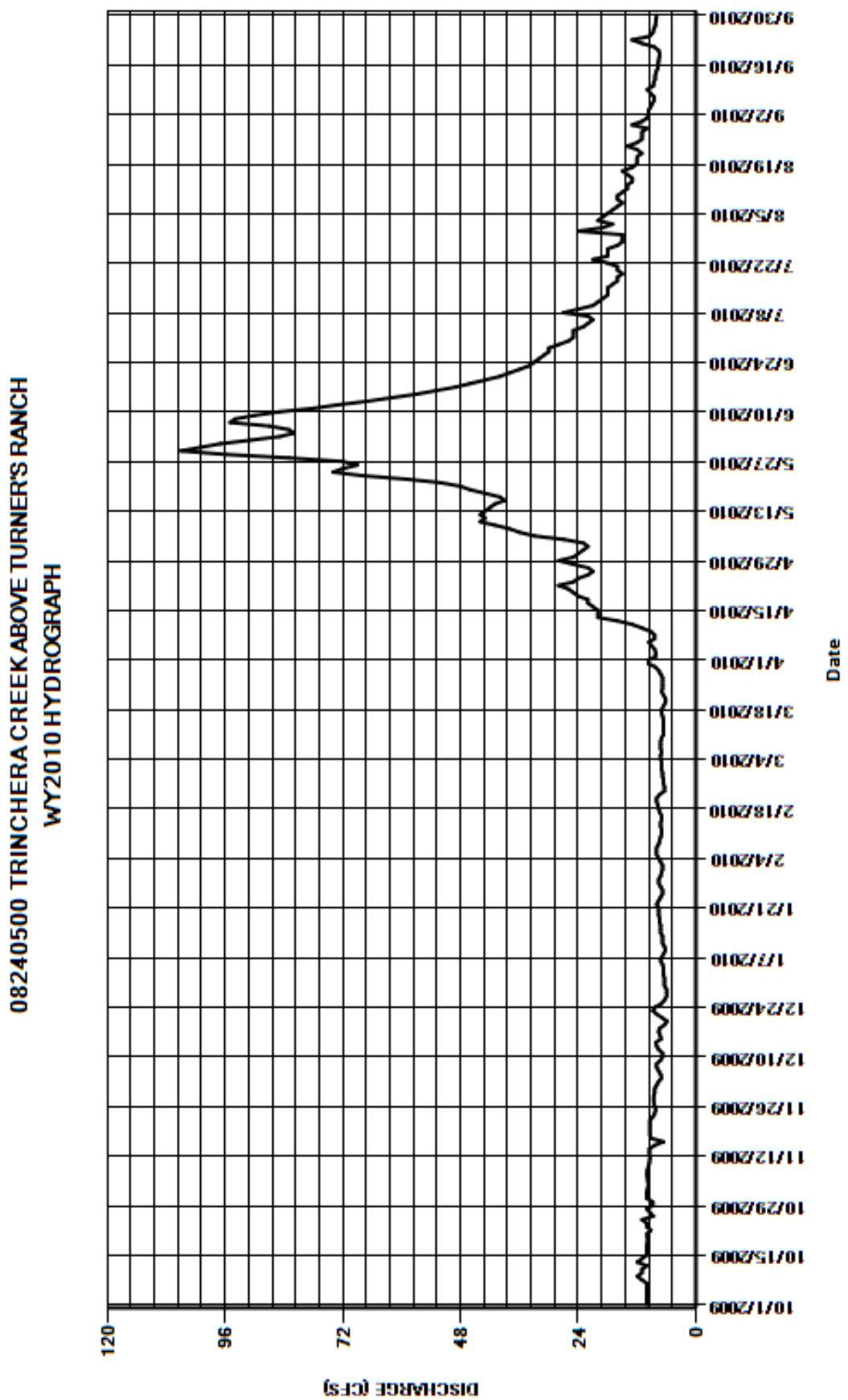
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	10	8.4	6.4	6.8	7	9.6	24	97	25	19	9.9
2	10	10	8	6.6	6.8	7	8.2	23	91	25	17	9.6
3	10	9.8	7.6	6.6	7.2	7	8.2	22	85	25	20	9.7
4	10	9.7	7	6.6	7.6	7.2	8.4	23	82	23	19	9.3
5	10	9.8	7.2	6.8	8	7.2	9.1	27	83	22	18	8.9
6	10	9.9	7.6	7.2	8	7	9.6	33	87	21	17	8.5
7	10	10	8	7	8	7.2	8.4	36	95	22	16	8.6
8	11	9.9	8	6.6	7.6	7.2	8.4	38	94	27	15	9.3
9	12	9.7	7.2	6.2	7.4	7.2	9.2	41	90	24	16	9.9
10	11	9.5	6.8	6.4	7.2	7	11	44	85	21	16	8.7
11	11	9.4	6.8	6.8	7	6.6	13	43	78	20	15	8.6
12	10	9.4	7.6	6.8	7	6.6	16	44	73	19	14	8.3
13	12	9.5	8	6.8	7.2	6.6	20	43	67	18	14	8.3
14	11	9.5	8.2	7.2	7.2	6.6	20	42	62	18	13	8.1
15	10	8.4	7.1	7.2	7	6.6	20	41	57	18	13	7.8
16	10	6.6	7.3	7.2	7	6.8	21	39	53	17	14	7.7
17	10	9.2	7.6	7.4	7.4	7	22	40	49	16	15	7.6
18	10	9.4	7.4	7.4	7.6	7	22	43	46	16	13	7.5
19	9.8	9.4	6.4	7.6	7.8	6.6	24	46	43	15	12	7.4
20	9.9	9.4	5.9	7.6	8	6.2	25	48	40	16	12	7.6
21	10	9.4	6.9	7.6	8	6.2	26	52	38	16	12	8.5
22	9.2	9.4	8	8	7.4	6.6	28	59	36	18	11	11
23	10	8.8	8.8	7.6	6.4	7	25	68	34	21	12	13
24	10	8.4	8.3	7.2	6.4	6.8	24	74	33	18	14	9.5
25	11	8.2	7	6.8	6.6	6.8	22	72	32	18	12	8.8
26	8.7	8.4	6.4	6.8	6.6	6.8	21	69	31	18	11	8.6
27	9.4	8.6	6	7.2	6.8	6.8	22	72	30	16	11	8.3
28	10	8.6	6	7.6	6.8	7.2	25	83	30	15	11	8.2
29	8.8	8.6	6	7.6	---	7.6	28	96	28	15	10	8.1
30	8.8	8.4	6.4	7.2	---	8.3	25	105	26	15	13	8
31	10	---	6.4	7	---	9.7	---	101	---	24	11	---
TOTAL	313.6	275.3	224.3	219.0	202.8	217.4	539.1	1591	1775	602	436	263.3
MEAN	10.1	9.18	7.24	7.06	7.24	7.01	18	51.3	59.2	19.4	14.1	8.78
AC-FT	622	546	445	434	402	431	1070	3160	3520	1190	865	522
MAX	12	10	8.8	8	8	9.7	28	105	97	27	20	13
MIN	8.7	6.6	5.9	6.2	6.4	6.2	8.2	22	26	15	10	7.4

CAL YR	2009	TOTAL	7147.1	MEAN	19.6	MAX	101	MIN	5.3	AC-FT	14180
WTR YR	2010	TOTAL	6658.8	MEAN	18.2	MAX	105	MIN	5.9	AC-FT	13210

MAX DISCH: 122 CFS AT 18:15 ON Jul. 08,2010 GH 4.46 FT. SHIFT 0.05 FT. (GH CORR. -0.02 FT. APPLIED)
 MAX GH: 4.46 FT. AT 18:15 ON Jul. 08,2010 (GH CORR. -0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER BASIN
08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
Water Year 2010

Location.-- Lat. 37°23'40", Long. 105°22'10", UTM X 467322.6, Y 4138726.6, SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T.31 S., R.71 W., (unsurveyed) Costilla County, Hydrologic Unit 13010002, on right bank of channel, 200 ft. West of road, approximately 1 1/2 miles above dam, 4 miles SE of Fort Garland.

Drainage and Period of Record.-- 61 mi 2 .

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in a 4-ft. diameter corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 24, 25, Dec. 1-4, 9-12, 15, 24-31, 2009, Jan. 1, 8, 9, 18, 23-27, 30, Feb. 14-19, 22-27, Mar. 3-7, 9, 11-13, 20, 21, 2010, when the stage-discharge relation was affected by ice; Jan. 31 – Feb. 13, 2010 when ice in well was affecting floats; and May 8-17, 2010 when inlets were plugged. There were no instrument corrections made to the shaft encoder. There was a -0.05 ft gage-height correction due to removing debris from the inlets on Oct. 7, 2009. This correction was prorated from the start of water year. There was a +0.03 ft flush correction on May 25, 2010, which was prorated from previous inflection point. There were two apparent flush corrections that were determined to be caused by temporary upset in inlet hydraulics. A +0.07 ft on Jun. 7 and a +0.09 ft on Jun. 15, 2010 were both applied forward as -0.07 ft and -0.09 ft respectively to the points where the upset in hydraulics self corrected.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Aug. 26, 2010 using B.M. No. 1 as base. The RP elevation was within allowable limits; therefore, a correction was not required or made. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a concrete weir approximately 15 feet below the gage. Due to fill in and above gage-pool, the concrete weir was ineffective as the control feature during most of the year. Due to the filling a temporary rating 8 was developed to aid the computation of the record. Rating No. 7, in use since Oct. 1, 2001 was used again this year up to Mar. 25, 2010 and temporary Rating No. 8 was used for the remainder of the water year. Twenty measurements (Nos. 864-883) were made this year ranging in discharge from 3.30 to 78.2 cfs. They cover the discharge range experienced except for the higher daily flow on May 30 and June 7-9, 2010. The peak flow of 95.6 cfs occurred at 0645 on May 30, 2010 at a gage height of 1.13 ft with a shift of 0.00 ft. It exceeded high measurement No. 876 (GH = 1.03 ft.), made Jun. 7, 2010, by 0.10 ft. in stage.

Discharge.-- Shifting control method was used during all open-water periods. A variable shift curve was used from Jun. 7 through Jul. 8, 2010 to better define stage related shifting. Remaining open-water shifts were applied as defined by measurements and distributed by time. Measured shifts varied from -0.11 to -0.01 feet while using Rating 7, and from -0.07 to +0.05 ft while using Rating 8. All measurements were given full weight and applied except Nos. 867, 868, 870, 874, 878, 879, and 883 which were adjusted as much as 8% to smooth shift distribution. There were two shifts resulting from removing debris from control. A -0.02 ft on Nov. 17, 2009 and a -0.04 ft on Apr. 14, 2010, which were both applied as shift corrections from assumed points of trash accumulation.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using two measurements, temperature records, and comparison with Trinchera Creek above Turner's Ranch. A temporary Rating 8 was developed to aid the computation of this record. During the water year there were numerous trash corrections and shift changes with stage due to deposition in the gage pool causing an increased slope and subsequently an increased velocity in the gage pool. The change in the gage pool caused greater positive shifting as the stage increased. Because of the limitations associated with the records spreadsheet Rating 8 was developed to enable shifting by time that resulted in smaller changes in shift, thereby reducing the potential for error as the stage changed. Hydrographic comparison with Trinchera Creek above Turners Ranch was used to help identify timing of events.

Remarks.-- Due to continuous change in slope due to changing fill in and above gage pool which made the concrete weir ineffective as the control, the record including the peak discharge should be considered fair except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman and Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR

RATING TABLE--

TRIMTNCO07 USED FROM 01-Oct-2009 TO 25-Mar-2010
TRIMTNCO08 USED FROM 25-Mar-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.7	9.5	7.2	5.6	4.4	4.4	6.6	22	70	17	17	4
2	8.1	11	7	6	4.4	4.4	5.2	17	69	17	13	3.8
3	8.8	9.4	6	5.9	4.4	4.4	5.5	14	63	18	15	4.1
4	9.1	9	4.8	5.9	4.6	4	5.2	14	62	17	14	4
5	8.3	8.9	4.6	6.1	4.8	4	5.1	15	62	16	14	3.5
6	7.8	9.5	5.3	5.9	4.8	4	4.7	16	64	17	13	4.8
7	8.6	9.5	5.9	5.7	4.8	4.4	4.9	19	77	18	13	5
8	12	9	6.4	5.4	4.6	4.6	4.4	22	74	23	11	4.9
9	9.8	8.8	5.6	5.2	4.4	4.6	4.8	25	79	25	11	5.6
10	9	8	4.8	5.6	4.2	4.6	6.1	28	71	16	11	4.7
11	8.7	8.4	4.8	5.5	4	4.4	7.3	28	65	16	9	4.6
12	8.9	9.1	5.6	5.3	4	4.4	11	28	59	17	7.4	4.4
13	9.7	9	6.2	5.4	4.4	4.4	14	27	55	15	6.9	4.7
14	9.5	9	6.2	5.3	4.4	4.6	16	26	51	16	6.5	4.8
15	9.1	8.7	5.6	5.2	4.2	4.5	17	25	47	16	5.4	4.6
16	8.7	6.6	5.5	5.3	4.2	4.7	20	23	48	14	8.5	4.1
17	8.8	7.1	5.6	5.2	4.2	5	22	24	45	13	11	3.6
18	8.3	9	5.5	5.2	4.4	5.2	20	31	42	12	7.9	3.7
19	8.5	9.7	5.5	5.4	4.4	4.7	24	35	40	11	8	3.6
20	8.6	9	5.5	5.3	4.4	4.2	27	35	37	10	7.5	3.4
21	8.5	8.8	5.6	5.2	4.4	5.2	28	36	32	11	5.7	4.4
22	7.5	8.9	5.8	5.3	4.2	6	22	42	28	12	6.9	6.8
23	7.9	7.7	6	5.2	3.8	5.8	17	53	26	18	6.8	15
24	9.5	5.8	5.6	5	3.8	5.5	16	55	23	14	8.7	8.3
25	9.4	6.4	5.2	4.8	4	6.4	16	54	25	13	6.3	7.8
26	8.4	7.5	5.2	4.8	4	5.7	15	52	22	14	5.5	7.1
27	8.5	7.7	5.2	5	4.2	5.5	18	55	20	12	4.8	6
28	9.3	7.3	5.2	5.3	4.4	5.4	18	60	19	11	4.5	5.9
29	8.8	7.5	5.6	5.1	---	5	22	66	17	10	4.5	5.3
30	8.2	7.3	5.6	4.6	---	4.8	22	82	16	10	7.1	5.6
31	9.3	---	5.6	4.4	---	6	---	72	---	22	5.4	---
TOTAL	274.3	253.1	174.2	165.1	120.8	150.8	424.8	1101	1408	471	276.3	158.1
MEAN	8.85	8.44	5.62	5.33	4.31	4.86	14.2	35.5	46.9	15.2	8.91	5.27
AC-FT	544	502	346	327	240	299	843	2180	2790	934	548	314
MAX	12	11	7.2	6.1	4.8	6.4	28	82	79	25	17	15
MIN	7.5	5.8	4.6	4.4	3.8	4	4.4	14	16	10	4.5	3.4

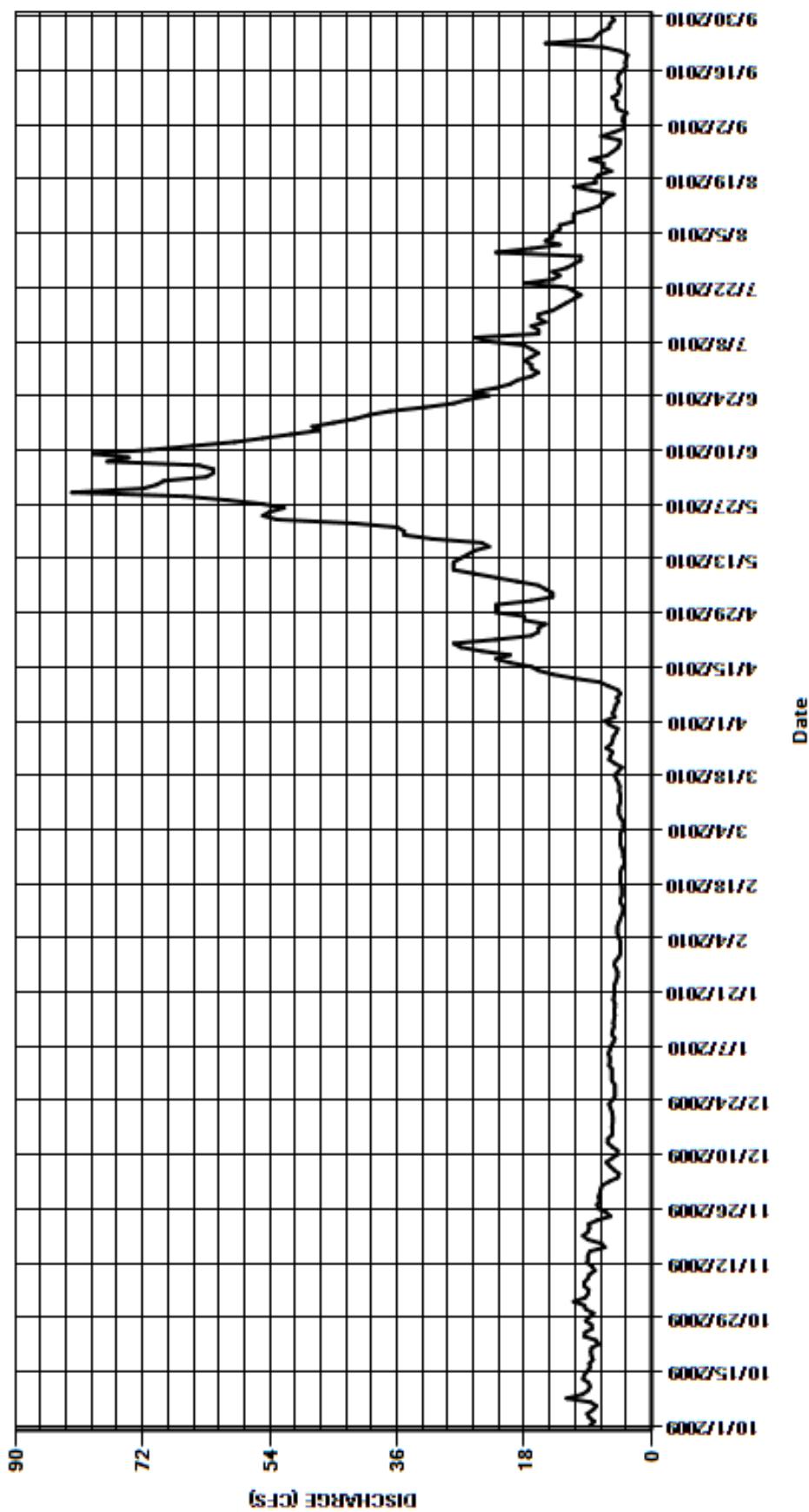
CAL YR	2009	TOTAL	5538.2	MEAN	15.2	MAX	79	MIN	3.7	AC-FT	10990
WTR YR	2010	TOTAL	4977.5	MEAN	13.6	MAX	82	MIN	3.4	AC-FT	9870

MAX DISCH: 95.6 CFS AT 06:45 ON May. 30,2010 GH 1.13 FT. SHIFT 0 FT.

MAX GH: 1.36 FT. AT 07:45 ON Jan. 08,2010 (Ice Affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOMER RESERVOIR
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
Water Year 2010

Location.-- Lat. 37°25'30", Long. 105°24'52", UTM X 463280.4, Y 4142102.4, in the SE 1/4 NE 1/4 S. 22, T. 30S, R72W, Costilla County, Hydrologic Unit 13010002, in Sangre de Cristo Grant, on left bank at ice house road bridge, 2,200 ft upstream from Garland Canal, 1.0 mi east of Fort Garland, and 6.3 mi upstream from Ute Creek.

Drainage and Period of Record.-- 190 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink2 with HDR GOES radio) and a float-operated shaft encoder in a 48-inch diameter CMP shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No changes were made this year.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of fifteen minute DCP transmitted data with DCP log and chart record as backups. Record is complete and reliable for the water year, except for Dec. 3, 2009 to Jan. 12, 2010 and Mar. 2 – 25, 2010, when the stage-discharge relation was affected by backwater from ice; Jan. 13 through Mar. 1, 2010, when inlets were frozen; and, Aug. 20-25, Sep. 15, 16, and 18-22, 2010, when the stage-discharge relation was affected by backwater from beaver dam(s). Three instrumentation corrections were made to the shaft encoder during the year ranging from -0.01 to +0.01 feet. These corrections were prorated by time back to the previous observation. An additional +0.10 ft. correction was made coming out of ice due to loss of oil in the cylinder during periods of low, ice-affected gage heights. There was one +0.01 ft flush correction, which was prorated back to previous inflection point. There was a -0.01 ft shaft encoder correction and a +0.01 ft flush correction on Oct. 7, 2010, but didn't affect discharge for this water year.

Datum Corrections.-- Last levels were run on Jul. 16, 2008 with no corrections required.

Rating.-- The control is a concrete weir approximately 14 feet downstream of the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. At higher flows the channel becomes the control and is subject to backwater from a downstream diversion structure. Rating No. 19-2 was created and used this water year. Rating No. 19-2 was drawn so that the upper end is the same as Rating No. 18, in use since October 1, 1979, and represents base rating conditions with minimal backwater. Twenty measurements (Nos. 877-896) were made this year ranging in discharge from 1.5 to 123 cfs. They cover the discharge range experienced except for lower daily flows on Dec. 4 and 5, 2009 and higher daily flows on April 22-26, 30, May 1, 2010. The peak flow of 174 cfs occurred at 1700 on Apr. 23, 2010 at a gage height of 3.75 ft (gage height correction of -0.01 ft. applied) with a shift of -0.50 ft. It exceeded high measurement No. 885 (GH = 3.10), made April 26, 2010, by 0.65 ft. in stage.

Discharge.-- Oct. 1, 2009 through Mar. 17, 2010 – shifts applied as indicated by measurements. Msmts 877 through 883 were used and all measurements were given full weight. Variable shift curves were applied based on backwater/non-backwater conditions. Application dates were determined by evaluating each of the possible scenarios, backwater/not backwater at each time there was a rapid change in stage. The scenario that best fit the measurements and diversion records was used to compute the record. SANFTGCO1001 is the variable shift curve that represents backwater conditions. This curve was developed from M883 – 885, 887, and 888. This shift curve is open ended due to increased backwater affects with increased stage caused by the downstream diversion structure, the shift curve was extended linearly to the peak stage for record computation using measurement 806 to further confirm this trend. Because the structure is concrete and previous year's measurements follow similar trends this backwater condition does not appear to be variable. Msmts 884, 885, and 887 were adjusted as much as 3% to smooth the shift curve. SANFTGCO1002 is the variable shift curve that represents non-backwater conditions. This curve was developed from Msmts 886, 889, and 890. The curve shows scour around the 2.00 ft stage and was developed to reflect this condition. The curve returns to the rating at 2.20 ft as was determined from the transition between backwater and non-backwater conditions identified on May 24, 2010. All measurements were adjusted as much as 2% to smooth the shift trend. Mar. 17-Apr. 27: SANFTGCO1001 (backwater). Apr. 27-May 10: SANFTGCO1002 (non-backwater). May 10-May 24: SANFTGCO1001 (backwater). May 24-June 15: SANFTGCO1002 (non-backwater). June 15, 2010 at 12:30 to September 30, 2010 – Shifts were prorated by time as indicated by measurements. Lower flows were observed in this period and are subject only to minor shifting due to scour and fill in the gage pool upstream of the concrete weir. Measurement shifts ranged from 0 to -0.03 ft. Measurements 893 and 894 were adjusted 4% to smooth the shifting.

Special Computations.-- August 20-25, September 15, 16, 18-22 were estimated due to backwater caused by beaver dam construction below gage. Estimates were based on shifts estimated by change in gage height from beaver dam removal applied over the period of beaver dam construction. Discharge for periods of no gage-height and ice affected record was estimated using three discharge measurements, comparison with the nearby stations and weather records from Trinchera Creek above Turners Ranch and Ute Creek near Fort Garland, and records from Ute and Trinchera SNOTEL observations. Estimations for this site were very difficult between January 11 and February 17 due to a large increase in flow that was likely due to precipitation during this period and melting of low and medium elevation snow.

Remarks.-- Record is fair above 52 cfs due to potential for backwater caused by downstream diversion structure and good below 52 cfs except for periods of backwater from ice and beaver dams and no-gage height record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner and Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND

RATING TABLE--

SANFTGCO19-2 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

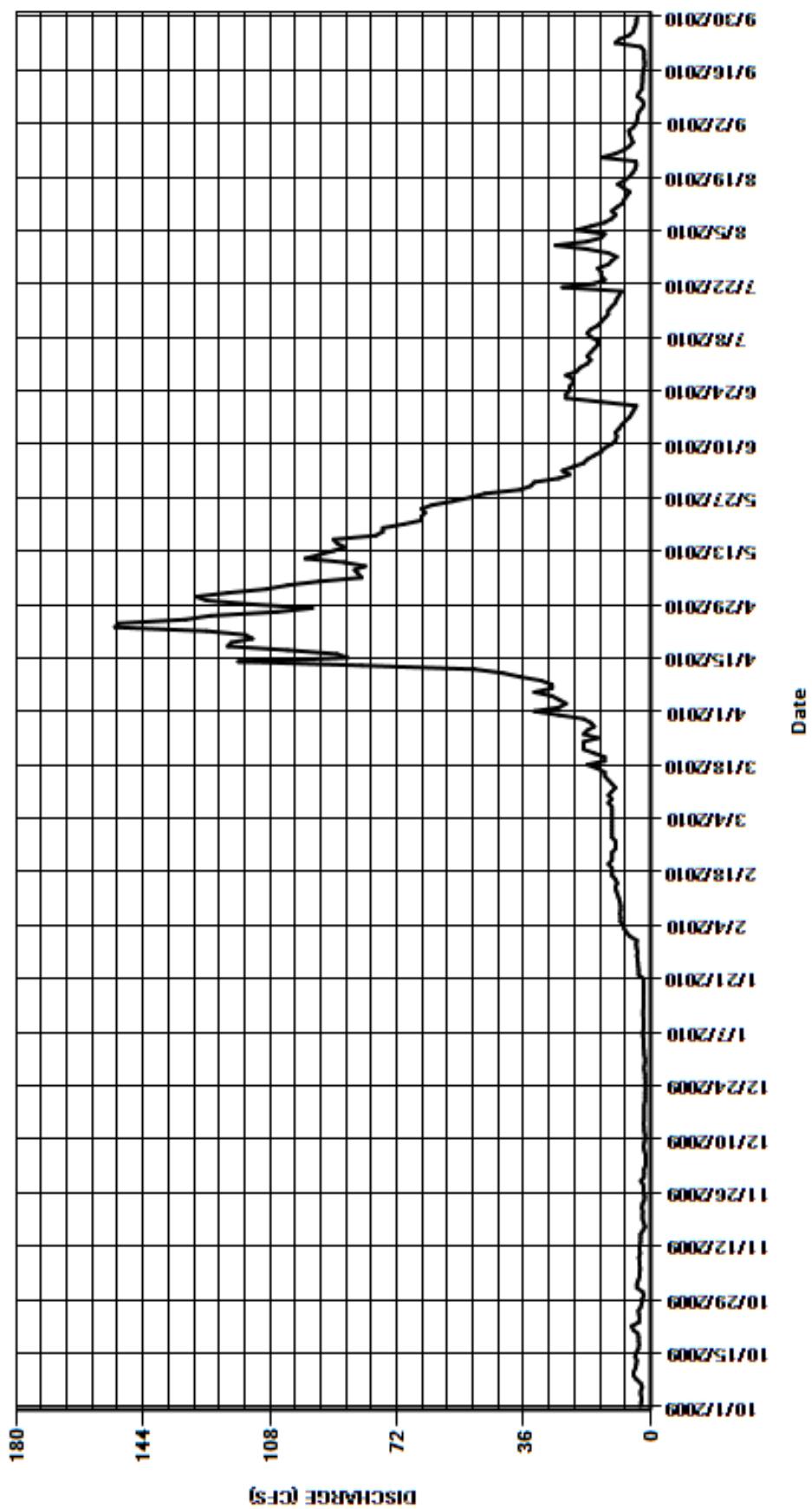
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	3.9	1.8	1.8	5.8	11	33	129	26	18	27	4.8
2	2.7	3.9	1.9	1.8	6.8	11	26	120	23	17	18	4.1
3	2.5	3.5	1.5	2	7.5	11	24	109	25	18	14	3.8
4	2.8	3.1	1.4	2	7.8	11	26	103	22	17	13	3.7
5	2.8	3.1	1.4	2	8.6	11	28	94	19	16	21	3.3
6	2.4	3	1.5	2.2	8.5	11	33	82	18	15	17	2.4
7	2.8	3.1	1.8	2.2	8.7	11	28	83	16	15	13	1.9
8	4	3.2	2	2	8.5	12	28	84	14	17	11	2.4
9	4.8	3.3	1.8	2	8.5	11	31	81	13	18	9.9	3.8
10	4.8	3	1.6	2	8.7	12	37	87	11	17	11	3.3
11	4.3	3.1	1.6	2.1	9	11	42	98	9.9	15	9.6	2.4
12	4.1	3.1	1.8	2.1	9.4	10	50	94	9.6	14	8	2.4
13	3.9	2.9	1.8	2.1	9.8	11	82	90	10	13	7.5	2.3
14	4.4	2.9	2	2	10	12	117	87	9	12	6.8	2.3
15	4.1	2.9	1.8	2	9.5	13	86	89	8.2	12	5.9	2.2
16	3.5	2.2	1.8	2.1	10	13	89	90	7.2	11	7.6	2.1
17	3.3	1.6	1.8	2	11	15	103	78	6	10	9.3	1.7
18	3.4	1.9	1.8	2	11	18	120	76	5.3	9.6	7.4	1.7
19	3.4	2.3	1.8	2	11	13	119	76	4.7	8.9	6	1.9
20	3.6	2.3	1.6	2	12	13	113	70	4.1	8.2	5.1	1.8
21	4.9	2.2	1.6	2.1	11	16	115	65	14	25	4.4	1.9
22	5.4	2.5	1.6	3.4	11	19	126	65	24	16	4.1	2.8
23	3.3	2.3	1.5	3.4	11	19	152	64	24	13	4.2	10
24	3.2	1.8	1.5	3.5	10	19	151	65	23	14	14	8.9
25	3.3	1.7	1.5	3.6	10	15	132	62	23	14	10	6.1
26	3.5	2.1	1.6	3.7	10	19	125	56	22	15	7.5	4.9
27	2.8	2	1.6	3.9	11	18	106	51	22	12	6	4.6
28	2.5	2.1	1.8	3.7	11	16	96	47	24	11	5	4.1
29	2.4	2.8	1.8	4	---	17	113	37	21	9.6	5.5	4
30	1.9	1.9	1.6	4.1	---	19	126	34	20	12	5.9	3.8
31	2.3	---	1.6	3.9	---	26	---	33	---	18	6.2	---
TOTAL	106.0	79.7	52.2	79.7	267.1	444	2457	2399	478.0	441.3	300.9	105.4
MEAN	3.42	2.66	1.68	2.57	9.54	14.3	81.9	77.4	15.9	14.2	9.71	3.51
AC-FT	210	158	104	158	530	881	4870	4760	948	875	597	209
MAX	5.4	3.9	2	4.1	12	26	152	129	26	25	27	10
MIN	1.9	1.6	1.4	1.8	5.8	10	24	33	4.1	8.2	4.1	1.7
CAL YR	2009	TOTAL	5609.54	MEAN	15.4	MAX	138	MIN	0.14	AC-FT	11130	
WTR YR	2010	TOTAL	7210.3	MEAN	19.8	MAX	152	MIN	1.4	AC-FT	14300	

MAX DISCH: 174 CFS AT 17:00 ON Apr. 23,2010 GH 3.75 FT. SHIFT -0.5 FT. (GH CORR. -0.01 FT. APPLIED)
MAX GH: 3.75 FT. AT 17:00 ON Apr. 23,2010 (GH CORR. -0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08242500 UTE CREEK NEAR FORT GARLAND
Water Year 2010

Location.--	Lat. 37°26'50", Long. 105°25'33", UTM X 462334.0, Y 4144571.1, in the S 1/2 S. 10, T. 30S, R. 72W, Costilla County, Hydrologic Unit 13010002, on left bank 1.5 mi north of Fort Garland, and 6 mi upstream from mouth.
Drainage and Period of Record.--	32 mi ² . Staff gage established on weir Mar. 1915 and operated to Oct. 1916. Continuous record from May 1923 to present at various locations close to present site.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping bucket rain gage in a 4 ft CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. There is an outside staff gage. The Sutron 8210 DCP was replaced with a Sutron Satlink2 on Aug. 18, 2010.
Hydrologic Conditions.--	
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 2-16, 2009 when floats were affected by ice in well; Oct. 29 – Nov. 1, 2009 and Apr. 2, 2010, when the stage-discharge relation was affected by ice; Nov. 17, 2009 through Mar. 25, 2010 when the station was closed for the winter.; and Jun. 6-8, 2010, when the stage-discharge relation was affected by trees that lodged on control and gage-pool. There were two shaft encoder corrections; a +0.01 ft. on May 5 and a -0.02 ft. on May 25, 2010. Both were prorated by time from previous visit. There were three flush corrections; a +0.02 ft. on Jun. 15, a +0.01 ft. on Jul. 8, and a +0.04 ft. on Aug. 18, 2010. All were prorated by time from previous inflection point.
Datum Corrections.--	Levels were run to the Reference point inside the gage October 26, 2009 using R.M. No. 1 as base. The gage reference point elevation was corrected -0.026 ft. A datum correction was run from the station opening on March 25, 2009 (WY2009) to Oct. 26, 2009 (WY2010) when correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on July 17, August 13, and August 26, 2009. An adjustment to instrument collimation was made on August 26, 2009. Two-peg tests were again performed on same instrument on Jul. 13 and Aug. 26, 2010, which showed the instrument was within tolerance.
Rating.--	The control is a concrete broad crested weir approximately 10 feet below the gage. Shifting occurs mainly due to the movement of streambed materials into the gage pool. This year, the gage-pool was filled with small cobbles, which became the primary controlling feature. Rating No. 18, created Sep. 13, 2008, was used again this water year. Eighteen measurements (Nos. 221-238) were made this year ranging in discharge from 3.36 to 114 cfs. They cover the flows experienced except for the lower daily flows on Dec. 11, 26-28, 2009, and the higher daily flows on Jun. 6, 7, 2010. The peak flow of 150 cfs occurred at 2330 on June 6, 2009 at a gage height of 3.08 feet with a shift of -0.20 feet. It exceeded high measurement No. 231 (GH = 2.88), made Jun. 7, 2010 by 0.20 feet in stage.
Discharge.--	Shifting applied for all open water periods was applied as described below. October 1-7, 2009, October 7-26, 2009, October 26–November 17, 2009: – a -0.08 ft shift was applied for the entire period based on Measurements 220, 221, and 222. Measurement 220 was adjusted -3% and the other measurements were used directly. The shift was held until the station was closed on November 17, 2010 due to ice. The hydrographic trend during this period was relatively stable with minor diurnals appearing October 26 due to freezing conditions. November 17, 2009 – March 25, 2010: shifts prorated by time, all record during this period was estimated. March 25–April 14, 2010: +0.01 ft shift was applied for the entire period as indicated by measurement 227 and measurement 228 with a +3% difference. Positive shifting is assumed to be a result of scour during the winter season. April 14-23, 2010: previous +0.01 ft shift was held to the end of the rising stage on April 23, 2010. April 23–May 5, 2010: +0.01 ft shift was prorated by time to a -0.02 ft shift as indicated by Measurement 229 over the period of generally falling stage. A large drop in gage height was observed May 5, 2010 although the cause is unknown it is assumed to be from a diversion above the gage. May 25-28, 2010: -0.02 ft shift was applied to all record during this period as indicated by measurement 229 and 230, with a -3% and +4% adjustments respectively. The hydrographic trends during this period included gradually rising stage, stable periods, and gradually falling stage. Measurement 230 was adjusted to -0.02 ft based on comparison with previous measurement and measurement 233, the other measurement most similar in stage. May 25-28, 2010: the shift was prorated from a -0.02 ft to a 0 ft at the peak on May 28. May 28-June 6, 2010: a 0 ft shift was applied as determined by Measurement 232. June 6-7, 2010: debris caught on the control identified by +0.20 ft change in gage height, a -0.20 ft shift applied over this period. June 7, 2010: chart recorder record was analyzed and three occasions of large changes in stage were observed as debris caught on the control and shifted as the stage changed. Applied shifts ranged from -0.23 ft to -0.12 ft. A measurement was made June 7, 2010 to identify the final shift of -0.21 ft, from which to back into the shifts starting June 6. June 7-8, 2010: shift from June 7 was held until hydros removed debris from control. June 8, 2010 measurement 232 indicated a 0 ft shift on this day, this shift was held from the debris removal to the start of the measurement. June 8, 2010 – September 30, 2010 a variable shift curve was developed from all measurements made after high water, measurement 232 through 239. This general shift trend is similar to the shifting pattern observed in WY2008 and WY2009; however, measurement 235 tends to show some increased filling that is causing the cobbles in the gage pool to affect the gage height at higher stages than has been observed in previous water years. In developing UTEFTGVS10-1 measurements 233, 237, and 238 were adjusted between -8% and +8% to smooth the shift curve. Measured shifts varied from -0.21 to +0.02 ft. The -0.21 ft. shift occurred at this year's high measurement and was caused by trees on the control. All measurements were given full weight except Nos. 228-230, and 233, which were adjusted by as much as 4% and Nos. 237 and 238, which were adjusted by as much as 8% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using five measurements and weather records. A hydrograph was used.

Remarks.--

Record is fair except for periods of no gage-height and ice affected record, which are poor; and the period of Jun. 6-8, 2010 including peak discharge, when trees were lodged on control and gage-pool, which is fair. Overall the measurements at this site generally show un-explained scatter, because of the uncertainty introduced by this scatter the open water record was downgraded to fair. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman and Andrea Taillacq.

Recommendations.--

The gage pool at this site needs to be cleaned to enable the concrete control to be the controlling feature at low flows. Additional work in the channel should be done to improve the measuring section and decrease measurement variability. These changes should return the record to a good rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08242500 UTE CREEK NEAR FORT GARLAND

RATING TABLE-- UTEFTGCO18 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

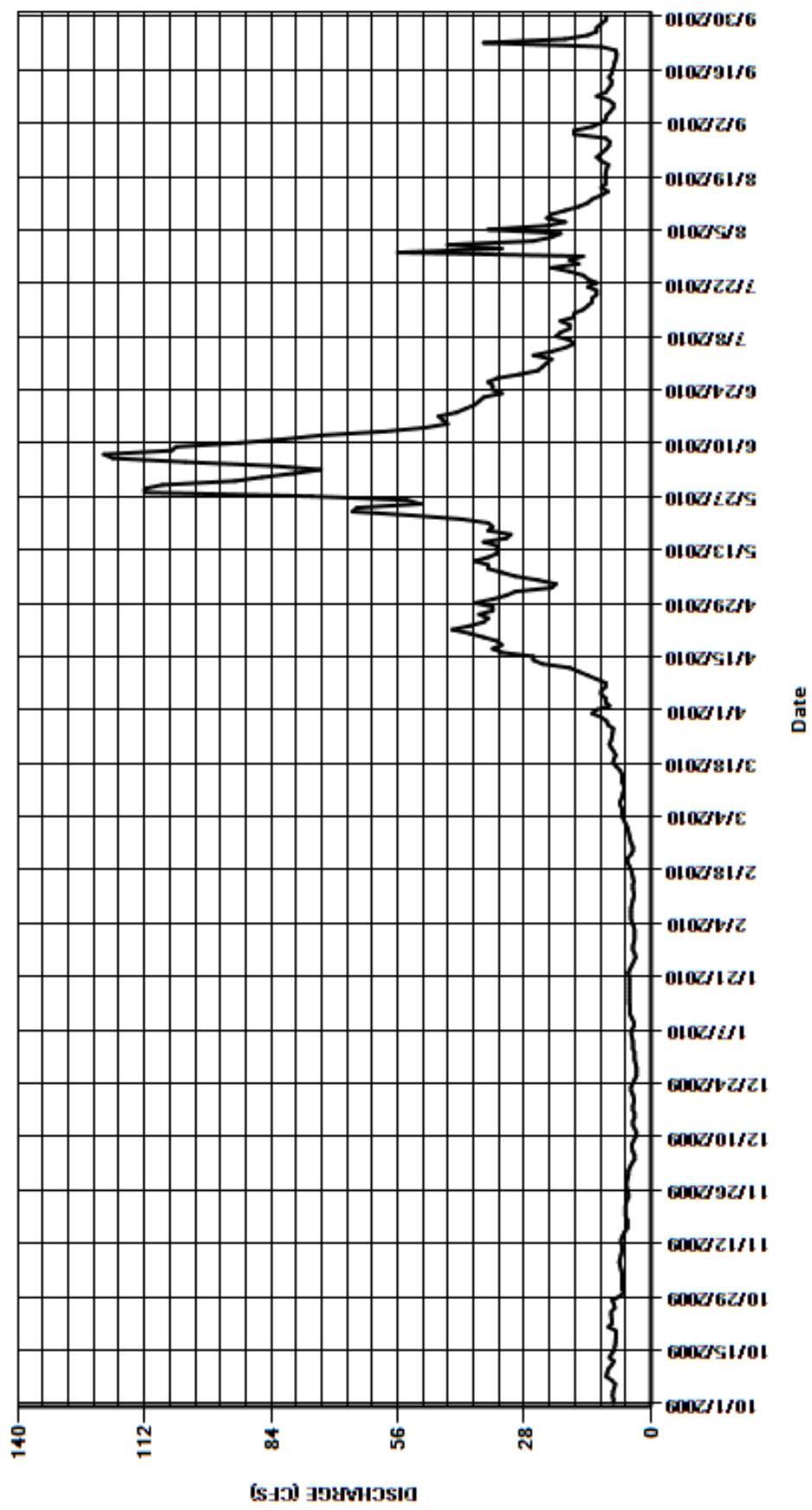
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.3	6.4	5	3.6	3.6	5.2	12	32	86	23	45	13
2	8.3	6.4	4.6	4	3.6	5.6	9.2	30	79	22	26	11
3	8.5	6.4	4.2	4	3.8	6	10	22	73	26	22	10
4	8.4	6.4	3.6	4	4.2	6.4	10	21	84	22	20	9.8
5	8.1	6.6	3.6	4.2	4.4	6.4	11	25	103	19	36	9
6	7.9	6.8	4	4.4	4.4	6.4	11	30	119	17	23	8.3
7	8.7	7	4.2	4.2	4.4	6.8	10	33	121	18	19	8.3
8	9.9	6.8	4.2	3.8	4.4	6.8	10	36	106	21	23	9.4
9	9.7	6.6	3.8	3.8	4.2	6.4	12	36	105	20	22	12
10	9.4	6.4	3.4	4.2	4	6.2	14	39	91	18	19	10
11	8.7	6.4	3.2	4.6	3.8	6	16	36	81	18	16	9.4
12	8.2	6.6	3.6	4.6	3.8	6	18	34	73	20	14	8.8
13	9.2	6.6	4	4.6	4	6.4	24	34	59	17	13	8.7
14	8.7	6.2	4	4.8	4	6.4	26	34	50	17	11	9.3
15	8.1	5.8	3.6	4.8	3.8	6.4	26	37	45	15	9.5	8.7
16	8	5.2	3.6	4.8	4	6.8	33	32	46	14	11	8.5
17	7.8	5.2	4	4.8	4.2	7.6	35	31	47	13	10	8.2
18	7.8	5.2	4	4.8	4.4	8.4	33	36	43	13	10	8
19	7.7	5.6	3.8	4.8	4.8	8.2	34	35	41	12	10	7.7
20	7.8	5.6	3.8	4.8	5.2	7.8	37	36	39	12	10	7.6
21	9.4	5.6	4	4.8	5.2	8.2	40	42	38	14	9.8	7.8
22	8.6	5.6	4.4	5	4.4	8.8	44	53	37	12	9.4	11
23	8.7	5.4	4.4	4.6	4	9.2	40	66	33	14	11	37
24	8.8	5	4	4.2	4	8.8	37	65	35	15	12	19
25	8.8	5	3.6	3.8	4.4	8.6	36	51	35	18	11	14
26	8	5.2	3.2	3.4	4.6	8.5	38	54	36	22	10	12
27	8.2	5.4	3.2	3.6	4.8	8.3	35	75	34	16	9.3	12
28	8.6	5.4	3.2	4	5	9.5	35	112	29	18	9.1	11
29	7	5.2	3.4	4	---	9.8	39	112	25	15	10	10
30	6	5	3.6	3.8	---	11	35	108	24	56	17	9.8
31	6.4	---	3.6	3.6	---	13	---	92	---	33	17	---
TOTAL	257.7	177.0	118.8	132.4	119.4	235.9	770.2	1479	1817	590	495.1	329.3
MEAN	8.31	5.9	3.83	4.27	4.26	7.61	25.7	47.7	60.6	19	16	11
AC-FT	511	351	236	263	237	468	1530	2930	3600	1170	982	653
MAX	9.9	7	5	5	5.2	13	44	112	121	56	45	37
MIN	6	5	3.2	3.4	3.6	5.2	9.2	21	24	12	9.1	7.6
CAL YR	2009	TOTAL	8047.5	MEAN	22	MAX	114	MIN	3.2	AC-FT	15960	
WTR YR	2010	TOTAL	6521.8	MEAN	17.9	MAX	121	MIN	3.2	AC-FT	12940	

MAX DISCH: 150 CFS AT 23:30 ON Jun. 06,2010 GH 3.08 FT. SHIFT -0.2 FT.

MAX GH: 3.08 FT. AT 23:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08242500 UTE CREEK NEAR FORT GARLAND
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
Water Year 2010

Location.-- Lat. 37°23'10", Long. 105°33'02", UTM X 451212.0, Y 4137849.6, in sec. 4, T.31 S., R.73 W., (unsurveyed), Costilla County, Hydrologic Unit 13010002, on right bank of channel, 0.6 mi downstream from Smith Reservoir, and 5.0 mi southwest of Blanca, CO

Drainage and Period of Record.-- 396 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Satlink2 with HDR GOES radio) and a float-operated shaft encoder in a 42 inch diameter corrugated metal shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of fifteen minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Oct. 1-7, 2009 when inlets were plugged and buried with silt due to the reservoir being drained for gate repair, and Dec. 3-15, 2009 when the well was frozen. The station was closed from Dec. 16, 2009 to Mar. 17, 2010. Three flush corrections and a trash correction were taken this year. The three flush corrections, each of +0.02 ft. were taken on Apr. 26, May 5 and 25, were prorated from previous gage height inflections. Debris was found on the control September 28, the -0.08 ft shift change (reduced from -0.10 ft to maintain continuity in the record) was prorated back to -0.13 ft on September 12 (magnitude verified with record continuity) when a rapid change in gage height indicates rocks were place on the control.

Datum Corrections.-- Levels were run to the Reference Point inside the gage Aug. 26, 2010 using BM No. 1 as base. The reference point elevation was within allowable limits, so the RP was not corrected. Also the new BM No. 5 was reestablished at an elevation of 5.914 ft. after being damaged while the gage pool was being cleaned. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13, and Aug. 26, 2010. All tests showed instrument was within tolerance, so no adjustment was made.

Rating.-- The control is a concrete weir approximately 5 feet downstream of the gage. The weir has been silted in since around 2001. Material was removed from the gage pool on March 25, 2010. Shifting occurs mainly due to moss growth and the movement of streambed materials in gage pool and approach. Rating No. 12 was developed and used this year. Seventeen measurements (Nos. 851-867) were made this year ranging in discharge from .10 to 131 cfs. They cover the range experienced except for the higher daily flows on Apr. 25 and 26, 2010. The peak flow of 154 cfs occurred at 0430 on Apr. 26, 2010 at a gage height of 4.11 ft. with a shift of 0.00 feet. It exceeded high measurement No. 859 made on Apr. 26, 2010 at a GH = 4.04 ft. by 0.07 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied by time with variation only for low stages (less than 2.90 ft). Measurements show shifts varied from -0.01 to +0.04 feet. Measurements 852, 853, 860-864 were adjusted as much as 7% to return to the rating, measurement 858 (0.11 cfs) was adjusted 16% back to the rating. Measurement 851 was made during the period of dam gate repair and was used directly due to variable site conditions occurring as a result of work. Measurements 857 and 867 were low flow measurements (0.18 cfs, 0.52 cfs) and were used directly.

Special Computations.-- Discharge for periods of no gage-height record was estimated using five discharge measurements, partial day records, and hydrographic comparison with nearby stations Trinchera above Mountain Home Reservoir and Trinchera above Turners Ranch. Weather records from Trinchera Creek above Turners Ranch and data trend before and after the periods were also used.

Remarks.-- Record is good, except for periods of no gage-height record, which is poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner and Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR

RATING TABLE--

TRISMICO12 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	5	3	6	0.1	0.1	0.11	89	39	28	12	2.8
2	2.8	4.1	2.8	6	0.1	0.1	0.11	86	38	28	12	5.4
3	2.9	3.3	2.5	6	0.1	0.1	0.11	84	38	28	12	6.1
4	2.9	3.3	2.5	6	0.1	0.1	0.13	76	38	28	12	6.3
5	2.8	3.1	3.5	6.5	0.1	0.1	0.13	68	38	28	12	6.4
6	3	2.8	3	6.5	0.1	0.1	0.11	59	38	27	12	6.5
7	3.6	2.8	4	6	0.1	0.1	0.11	60	38	28	12	6
8	3.5	2.5	4	5.5	0.1	0.1	0.11	58	38	28	12	5.5
9	3.4	2.3	3	5	0.1	0.1	0.1	60	38	27	12	3.2
10	2.6	2.3	3	5	0.1	0.1	0.11	58	38	25	12	2.1
11	2.5	2.5	3.5	5.5	0.1	0.1	0.11	61	34	25	12	1.8
12	2.8	2.5	4	5.5	0.1	0.1	0.12	62	28	25	12	1.6
13	3.2	2.3	4	5.5	0.1	0.1	0.12	57	27	24	12	1.5
14	2.8	2.2	3.8	5	0.1	0.1	0.11	56	26	24	12	1.4
15	2.3	2.1	3.5	5	0.1	0.1	2.5	58	23	24	12	1.4
16	2.8	1.6	4.5	5	0.1	0.1	7.8	58	21	20	11	1.2
17	3.2	4.1	5	5	0.1	0.14	9.5	55	21	17	11	1.3
18	3.3	4.3	4.5	5	0.1	0.17	6.8	51	25	17	11	1.3
19	2.9	4.5	4.5	5	0.1	0.1	4.9	50	27	16	12	1.2
20	2.8	4.3	5	4.5	0.1	0.1	9.1	47	27	14	11	1.3
21	2.7	4.3	5	4	0.1	0.16	41	44	27	13	11	1.3
22	2.7	4.2	4.5	3	0.1	0.16	62	40	27	13	11	1.7
23	3.2	3.1	4	0.1	0.1	0.16	73	39	26	13	11	1.8
24	3.1	3	3.5	0.1	0.1	0.14	106	40	26	13	11	1.9
25	3.3	3.5	3	1	0.1	0.13	134	43	26	13	11	1.2
26	3.9	3	3	0.1	0.1	0.13	137	40	22	12	11	0.39
27	3	3	3.5	0.1	0.1	0.14	112	39	20	12	11	0.52
28	4.8	3	3.5	0.1	0.1	0.13	87	38	20	12	11	0.48
29	5.8	3	4	0.1	---	0.14	84	40	24	12	10	0.5
30	5.6	3	3.5	0.1	---	0.15	88	41	28	12	6.5	0.36
31	5.3	---	3.5	0.1	---	0.12	---	40	---	12	3.3	---
TOTAL	102.0	95.0	114.6	118.30	2.80	3.67	966.19	1697	886	618	343.8	74.45
MEAN	3.29	3.17	3.7	3.82	0.1	0.12	32.2	54.7	29.5	19.9	11.1	2.48
AC-FT	202	188	227	235	5.6	7.3	1920	3370	1760	1230	682	148
MAX	5.8	5	5	6.5	0.1	0.17	137	89	39	28	12	6.5
MIN	2.3	1.6	2.5	0.1	0.1	0.1	38	20	12	3.3	0.36	

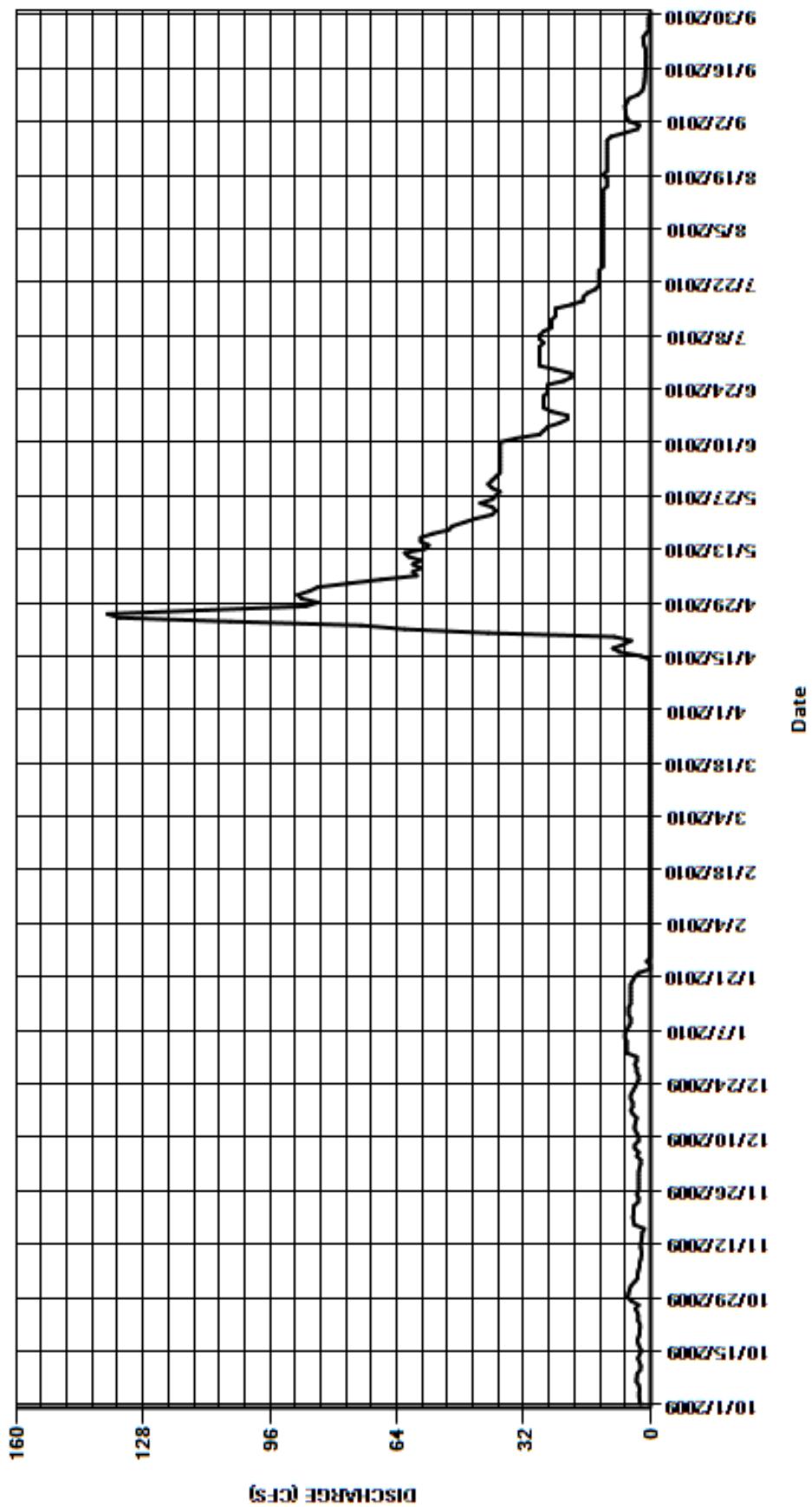
CAL YR	2009	TOTAL	7582.2	MEAN	20.8	MAX	127	MIN	1.3	AC-FT	15040
WTR YR	2010	TOTAL	5021.81	MEAN	13.8	MAX	137	MIN	0.1	AC-FT	9960

MAX DISCH: 154 CFS AT 04:30 ON Apr. 26,2010 GH 4.11 FT. SHIFT 0 FT.

MAX GH: 4.11 FT. AT 04:30 ON Apr. 26,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR
Water Year 2010

Location.-- Lat. 37°21'18", Long. 106°32'37", UTM X 363239.8, Y 4135373.7, Conejos County, Hydrologic Unit 13010005, on left bank 1,100 ft downstream from valve house for Platoro Reservoir and 0.7 mi northwest of Platoro.

Drainage and Period of Record.-- 40 mi². 1937 – 1953 at site one mile downstream. May 1952 to current year at present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio) and a float-operated shaft encoder, and air temperature sensor in a timber shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 150 feet below gaging station. No changes this water year.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 2, 2009 through Apr. 16, 2010 when the station was closed for the winter. From Apr. 16-17, and Apr. 26-29, 2010, the gage-height was affected by snowmelt from around gage flowing into the well faster than lower inlet could expel it. The period from April 17 until April 26, 2010 had a higher stage and it was assumed that water flowing into well during this period had no effect on the gage height due to all inlets being under water at this gage height. There were two instrument corrections made to the shaft encoder during the year: a +0.01 ft correction on Apr. 28, 2010 and a -0.01 ft correction on May 17, 2010 both prorated back to the previous visit.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run on August 18, 2009, using B.M. 1 as base. The RP was within allowable limits, so no correction was made or required.

Rating.-- A concrete slab weir with sloping sides acts as the control. Rating No. 14 was used this water year. This rating is well defined from 4 to 825 cfs. Thirteen measurements (Nos. 867-879) were made this year ranging in discharge from 7.13 to 266 cfs. Measurements cover the discharge range experienced except for the higher daily flows on May 21-25, 28-31, June 8, 9, 23-30, July 2-4, 2010. The peak flow 434 cfs occurred at 0500 on May 24, 2010 at a gage height of 2.83 ft. with a shift of -0.01 ft. It exceeded high measurement No. 875 (GH = 2.34) by 0.49 ft. in stage.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. Two measurements were made on Apr. 16, 2010, when station was opened. The gage-heights during these measurements were elevated due to snowmelt water running into gage faster than inlets could expel it and produced large negative shifts. These measurements resulted in shifts of -0.27 ft, before increasing reservoir release, and -0.07 ft after increasing release. The -0.07 ft shift was applied until the release was increased again the next day, which diminished the elevated gage-height effect. The -0.01 shift from measurement 873 was applied during the higher stage period from Apr. 17 to Apr. 26, 2010. Excluding the measurements from Apr. 16, 2010, measured shifts ranged from -0.03 feet to +0.04 feet during the water year. All measurements were given full weight and applied except numbers 868, 873 and 879, which were adjusted as much as 5 percent to smooth shift distribution.

Special Computations.-- Discharge for the period of no gage-height record was estimated based on two measurements and partial day records. A winter estimation hydrograph was not used since flow is controlled by Platoro Reservoir and there were no reservoir gate adjustments made while the station was closed.

Remarks.-- Record is good except for period of no gage-height record, which is rated fair since the gage is directly below a reservoir and gate changes were not made during the period; and the period of Apr. 17-29 which is considered fair since there was some uncertainty in gage-heights due to snowmelt water running into well. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR

RATING TABLE-- CONPLACO14 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

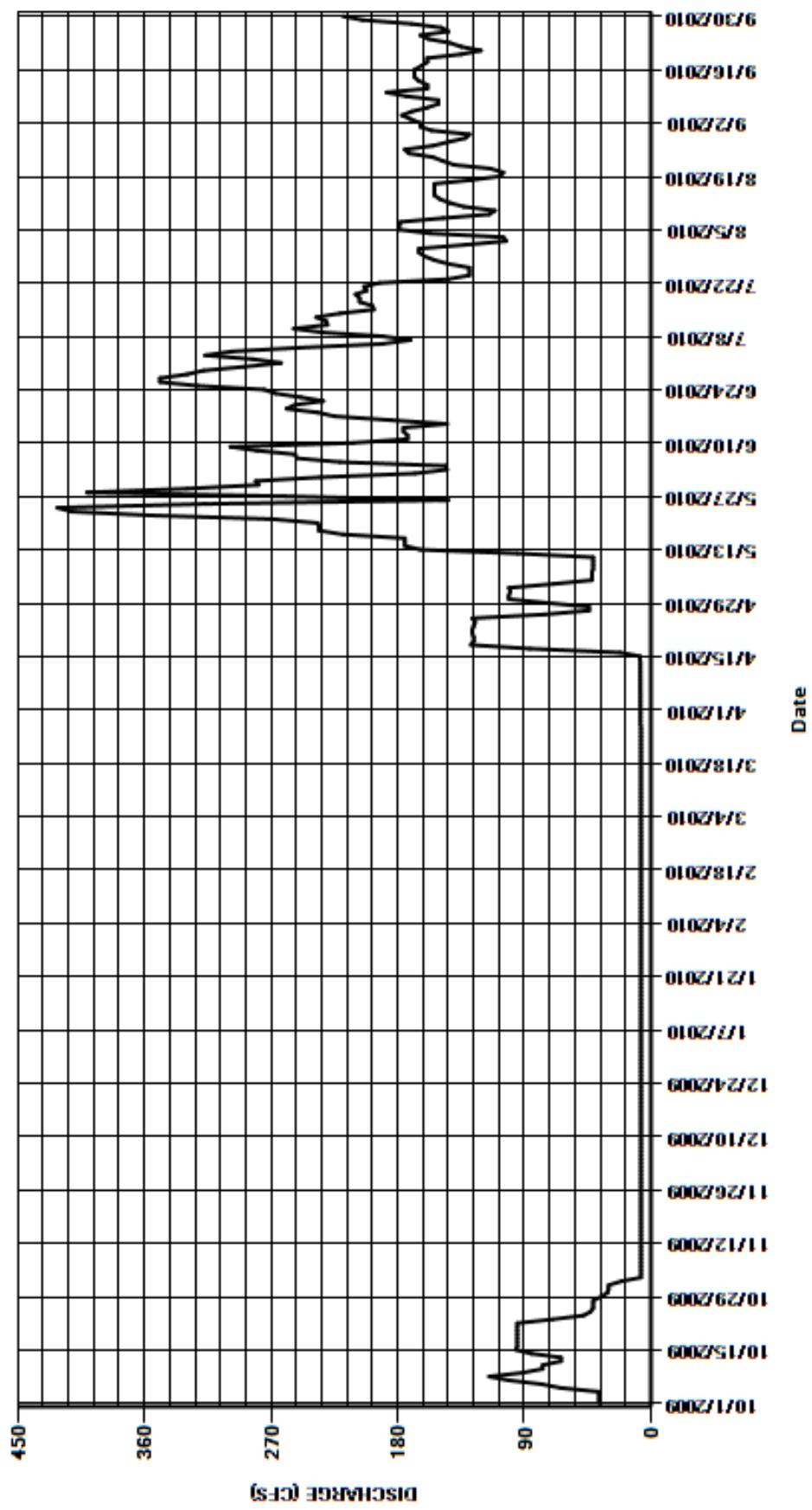
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	30	7.1	7.1	7.1	7.2	7.3	101	235	263	132	164
2	37	21	7.1	7.1	7.1	7.2	7.4	100	168	283	103	164
3	37	7.1	7.1	7.1	7.1	7.2	7.4	101	145	317	105	171
4	37	7.1	7.1	7.1	7.1	7.2	7.4	69	146	298	157	177
5	64	7.1	7.1	7.1	7.1	7.2	7.4	42	221	250	179	170
6	78	7.1	7.1	7.1	7.1	7.2	7.5	42	252	191	179	159
7	101	7.1	7.1	7.1	7.1	7.2	7.5	42	253	171	178	151
8	115	7.1	7.1	7.1	7.1	7.2	7.5	41	280	191	148	151
9	91	7.1	7.1	7.1	7.1	7.2	7.5	41	299	233	115	174
10	77	7.1	7.1	7.1	7.1	7.2	7.6	41	212	254	111	188
11	77	7.1	7.1	7.1	7.1	7.2	7.6	41	173	230	133	159
12	64	7.1	7.1	7.1	7.1	7.2	7.6	95	173	231	143	159
13	64	7.1	7.1	7.1	7.1	7.2	7.6	164	176	238	150	165
14	85	7.1	7.1	7.1	7.1	7.2	7.7	175	176	221	154	168
15	96	7.1	7.1	7.1	7.1	7.2	7.7	175	145	197	154	168
16	95	7.1	7.1	7.1	7.1	7.2	22	175	185	198	154	168
17	95	7.1	7.1	7.1	7.1	7.2	86	219	225	207	154	163
18	95	7.1	7.1	7.1	7.1	7.2	128	236	237	207	128	159
19	95	7.1	7.1	7.1	7.1	7.2	126	236	259	210	107	159
20	95	7.1	7.1	7.1	7.1	7.2	126	237	253	202	105	135
21	95	7.1	7.1	7.1	7.1	7.2	127	269	233	204	114	121
22	95	7.1	7.1	7.1	7.1	7.2	127	356	249	193	140	135
23	70	7.1	7.1	7.1	7.1	7.2	126	412	267	144	148	143
24	48	7.1	7.1	7.1	7.1	7.2	125	422	275	129	155	158
25	43	7.1	7.1	7.1	7.1	7.2	127	317	322	129	172	164
26	41	7.1	7.1	7.1	7.1	7.2	76	144	349	129	175	144
27	41	7.1	7.1	7.1	7.1	7.2	44	260	349	144	155	149
28	41	7.1	7.1	7.1	7.1	7.3	44	401	330	154	144	170
29	35	7.1	7.1	7.1	---	7.3	73	330	318	161	132	205
30	31	7.1	7.1	7.1	---	7.3	101	279	289	165	129	219
31	30	---	7.1	7.1	---	7.3	---	281	---	165	156	---
TOTAL	2105	249.8	220.1	220.1	198.8	223.6	1570.7	5844	7194	6309	4409	4880
MEAN	67.9	8.33	7.1	7.1	7.1	7.21	52.4	189	240	204	142	163
AC-FT	4180	495	437	437	394	444	3120	11590	14270	12510	8750	9680
MAX	115	30	7.1	7.1	7.1	7.3	128	422	349	317	179	219
MIN	30	7.1	7.1	7.1	7.1	7.2	7.3	41	145	129	103	121
CAL YR	2009	TOTAL	30642.9	MEAN	84	MAX	697	MIN	7.1	AC-FT	60780	
WTR YR	2010	TOTAL	33424.1	MEAN	91.6	MAX	422	MIN	7.1	AC-FT	66300	

MAX DISCH: 434 CFS AT 05:00 ON May. 24,2010 GH 2.83 FT. SHIFT -0.01 FT.

MAX GH: 2.83 FT. AT 05:00 ON May. 24,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08245000 CONEJOS RIVER BELOW PLATERO RESERVOIR
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08246500 CONEJOS RIVER NEAR MOGOTE
Water Year 2010

Location.-- Lat. 37°03'14", Long. 106°11'13", UTM X 394411.1, Y 4101511.0, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, T.33 N., R.7 E., Conejos County, Hydrologic Unit 13010005, on left bank 75 ft downstream from bridge on State Highway 174, 0.4 mi downstream from Fox Creek, 5.3 mi west of Mogote, and 10 mi west of Antonito.

Drainage and Period of Record.-- 282 mi². Intermittent, non-recording data from 1903-1915 at various sites. Water stage recorder from 1915-Oct. 1988 at different site. Oct. 1988-present, water stage recorder at current site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, and tipping bucket rain gauge in a 5 ft. diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except the stage-discharge relation was affected by ice Nov. 16, 2009 through Feb. 26, 2010. There was a -0.01 ft instrument correction made to the shaft encoder on Jan. 14, 2010 which was prorated by time from previous visit. There was a +0.02 ft flush correction on Apr. 15, 2010, which was prorated by time from previous inflection point.

Datum Corrections.-- Levels were not run to the Reference Point (RP) inside the gage this year due to the stability of benchmarks and RP observed during levels in previous years. Levels were last run on July 28, 2008.

Rating.-- Low flow control is a cobblestone riffle approximately fifty feet below the gage. Middle to high flows are channel control. Rating No. 13, in use since March 3, 2008, was used for the entire water year. It is well defined from 10 to 2100 cfs. The rating was extended to 9200 cfs using the high end of the results of a cooperative rating curve extension project with the USGS in 2002. Twenty-seven measurements (Nos. 174-200) were made this year ranging in discharge from 33.7 to 1,680 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 28-30, 2010 and lower daily flows on Dec. 4, 5, 10, 25-28, 2009. The peak flow of 2330 cfs occurred at 0600 on May 29, 2010 at a gage height of 5.60 feet with a shift of -0.04 feet. It exceeded high measurement No. 191 (GH=4.90), made May 24, 2010 by 0.70 feet in stage. The WY2010 measurements show some negative shifting above 3.83 ft, however rating error was within allowable tolerance. Similarly positive shifting is noted below approximately 3.16 ft, these shifts are also within allowable tolerance and are primarily caused by measurement error combined with rating curve resolution. These shifts do not warrant a new rating curve.

Discharge.-- Shifting control method was used for the entire water year. Shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from -0.06 to +0.07 feet. All were given full weight except for Nos. 174, 175, 176, 186, 187, 192, 196, and 199 which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice-affected record was estimated using seven measurements, weather records, partial day record, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08246500 CONEJOS RIVER NEAR MOGOTE

RATING TABLE--

CONMOGCO13 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

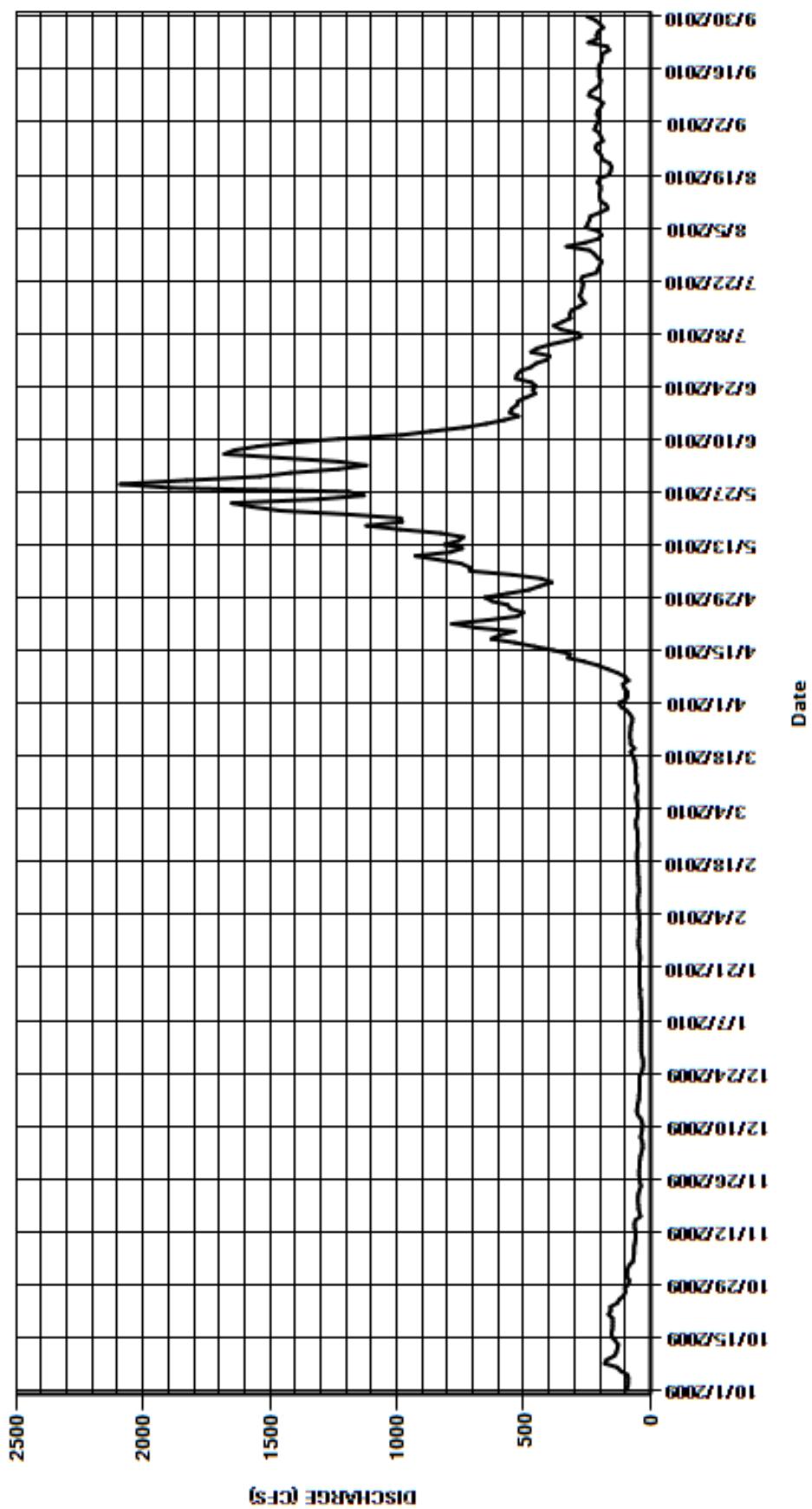
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	93	42	38	44	57	126	479	1420	407	258	215
2	90	91	40	38	44	51	97	437	1230	398	207	207
3	89	85	36	38	46	51	90	389	1120	471	193	203
4	88	70	32	38	46	49	92	432	1230	448	205	212
5	91	68	32	38	48	52	104	544	1460	397	256	208
6	117	66	34	38	50	54	110	711	1680	331	248	197
7	132	66	40	38	50	57	87	715	1640	276	241	188
8	181	65	36	36	50	55	101	749	1550	284	237	207
9	173	62	34	36	48	51	130	838	1420	353	199	244
10	143	60	32	38	46	52	169	927	1230	382	169	237
11	135	60	34	38	46	58	209	788	983	348	175	215
12	131	60	40	38	48	59	262	742	866	316	197	200
13	128	63	52	40	48	58	326	812	737	319	201	197
14	139	64	54	42	48	59	317	757	649	313	201	203
15	152	60	52	40	50	58	383	738	577	282	198	203
16	154	40	50	44	50	61	457	826	521	259	198	205
17	151	44	46	44	50	64	534	987	555	272	209	203
18	150	48	46	44	52	70	628	1120	547	280	202	194
19	149	48	44	44	54	79	595	980	527	273	163	192
20	150	50	44	44	54	64	535	985	522	269	158	192
21	166	50	44	44	52	78	689	1190	490	266	154	164
22	157	48	44	44	50	78	783	1460	455	275	161	172
23	159	44	44	42	50	82	642	1570	465	268	190	245
24	132	38	36	42	52	81	524	1650	452	214	194	211
25	123	42	32	44	52	79	502	1310	471	207	206	213
26	106	44	30	46	52	78	552	1130	531	200	218	206
27	99	46	30	48	56	73	563	1190	527	192	212	187
28	102	46	32	48	58	72	625	1890	513	210	188	200
29	88	44	36	46	---	81	653	2090	472	222	196	219
30	84	44	38	46	---	94	564	1830	452	240	202	252
31	94	---	38	46	---	116	---	1540	---	331	221	---
TOTAL	3949	1709	1224	1290	1394	2071	11449	31806	25292	9303	6257	6191
MEAN	127	57	39.5	41.6	49.8	66.8	382	1026	843	300	202	206
AC-FT	7830	3390	2430	2560	2760	4110	22710	63090	50170	18450	12410	12280
MAX	181	93	54	48	58	116	783	2090	1680	471	258	252
MIN	84	38	30	36	44	49	87	389	452	192	154	164
CAL YR	2009	TOTAL	116858	MEAN	320	MAX	1830	MIN	30	AC-FT	231800	
WTR YR	2010	TOTAL	101935	MEAN	279	MAX	2090	MIN	30	AC-FT	202200	

MAX DISCH: 2330 CFS AT 06:00 ON May. 29,2010 GH 5.6 FT. SHIFT -0.04 FT.

MAX GH: 5.6 FT. AT 06:00 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08246500 CONEJOS RIVER NEAR MOGOTE
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08247500 SAN ANTONIO RIVER AT ORTIZ
Water Year 2010

Location.-- Lat. 36°59'35", Long. 106°02'17", UTM X 407576.8, Y 4094607.5, in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, T.32 N., R.8 E., Rio Arriba County, New Mexico, Hydrologic Unit 13010005, on left bank 800 ft south of Colorado-New Mexico State line, 0.4 mi southeast of Ortiz, and 0.4 mi upstream from Los Pinos River.

Drainage and Period of Record.-- 110 mi². April 1919 to Oct. 1920, Oct. 1924 to current year (no winter record prior to 1941). Monthly data only for some periods.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 with HDR GOES radio) and a float-operated shaft encoder in a 42 inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Sutron 8210 replaced with Sutron Satlink2 on Sep. 9, 2010. Bank operated cableway installed October 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Oct. 30 – Nov. 1, 2009, Nov. 15, 2009 – Jan. 8, 2010, and Mar. 16 – Apr. 10, 2010, when the stage-discharge relation was affected by ice; and, Jan. 9 – Mar. 15, 2010 due to well, oil cylinder, and inlets freezing. There was no flow July 22, Aug. 16 – Sep. 28, 2010 (46 days). Six instrument corrections were made to the shaft encoder during the year ranging from -0.01 to +0.13 feet. The correction of +0.13 feet, made on Apr. 15, 2010, was distributed from point on Apr. 9, 2010 where comparison with chart recorder data indicates the oil cylinder overtopped. All others were prorated by time from previous visit.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on July 13, 2010 using B.M. No. 4 as base. The gage was within allowable limits but the tape length was 0.01 ft too long. The RP support was reinforced so a +0.006 correction was made to set RP equal to tape length (9.22 ft). Two-peg tests were performed on the Lietz level (SN 130869) on July 13 and August 26, 2010, no adjustments were needed or made.

Rating.-- Control consists of two shifting gravel bars approximately 50 feet and 100 feet below the gage and the channel at higher stages. Rating No. 15-1, was developed and used from October 1 to December 31, 2009; Rating No. 16-2 was developed and used for the remainder of the water year. Rating 15-1 was developed from WY2009 measurements and measurements from the beginning of WY2010, this rating is not well defined. Rating 16-2 was developed using measurements from WY2010 which included high flow measurement number 78 at a stage of 3.80 ft, and discharge of 336 cfs. Although rating 16-2 was fairly well defined, the control at the site was destroyed sometime during the no-flow period in September and was rebuilt October 20-21, 2010. Twenty-eight measurements (Nos. 63-90) were made this year, ranging in discharge from 0 to 336 cfs (0.02 cfs was measured, but not used). The measurements cover the discharge range experienced except for higher daily flows on Apr. 11-13 and 22, 2010. The peak flow of 964 cfs occurred at 2215 on Apr. 12, 2010 at a gage height of 5.90 feet (GH corr. +0.13 ft applied) with a shift of -0.03 feet. It exceeded high measurement No. 78 (GH=3.80), made May 7, 2010 by 2.10 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Measurements show shifts ranged from -0.03 and +0.01 feet. All open water measurements were given full weight and applied except for No. 86 which was not used due to poor measurement conditions.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using ten measurements, weather records, partial day records, and comparison with the station 'Los Pinos River near Ortiz'. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height, ice affected record, and extreme low flows, which are poor. Also, the high flow period of Apr. 12, 13, 2010 including the peak discharge should be considered poor due to lack of high measurements defining upper end of rating. Station maintained by Div 3 hydrographic staff and record developed by Andrea C. Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08247500 SAN ANTONIO RIVER AT ORTIZ

RATING TABLE--

SANORTCO15-1 USED FROM 01-Oct-2009 TO 31-Dec-2009
SANORTCO16-2 USED FROM 01-Jan-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

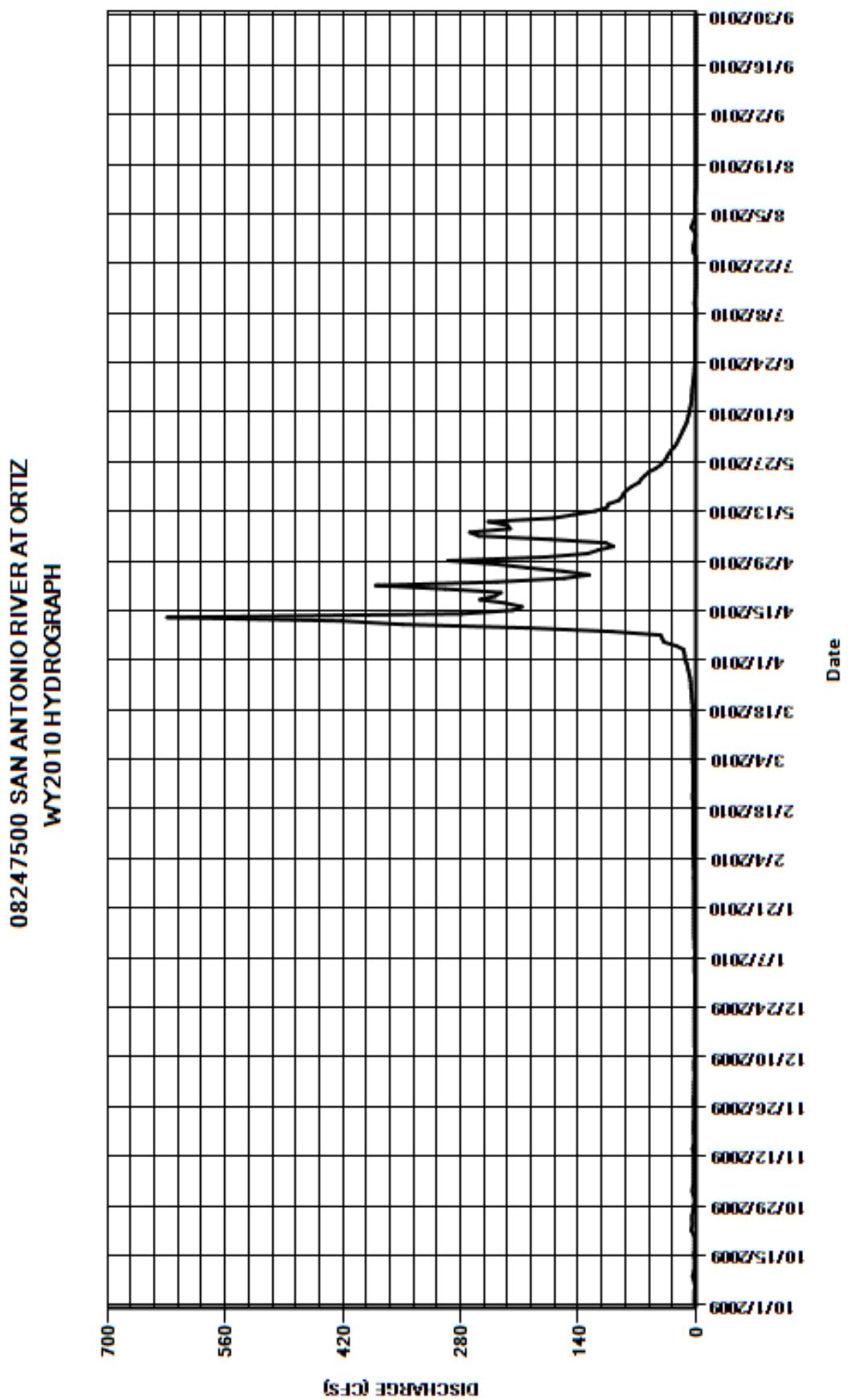
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	3	2.4	1.4	2.6	3.6	13	129	23	1.3	5.8	0
2	2.1	4.4	2.4	1.4	2.8	3.6	13	116	21	1.2	4.1	0
3	1.9	3.8	2.2	1.6	3	3.8	14	98	19	1.1	2.3	0
4	1.7	3.1	1.8	1.6	3	3.8	15	107	17	0.97	1.3	0
5	1.7	2.8	1.8	1.6	3.2	4	24	173	15	1.1	1	0
6	0.98	2.8	2	1.6	3.4	4	38	259	13	0.73	0.84	0
7	1.7	2.8	2.2	1.6	3.4	4	40	269	11	0.5	1.3	0
8	2.6	2.6	2.2	1.4	3.6	4	42	221	10	0.4	0.82	0
9	3.9	2.7	2	1.4	3.6	4	100	224	8.8	0.31	1.3	0
10	2.7	2.8	1.6	1.8	3.4	3.8	200	247	7.8	1.6	0.9	0
11	2.1	2.7	1.2	1.8	3.4	3.8	349	169	7.1	1.7	0.54	0
12	1.7	2.7	1.4	2	3.2	3.8	422	145	6.1	1	0.24	0
13	1.8	3	1.6	2	3.2	3.8	629	120	5.3	0.72	0.12	0
14	2	4.1	1.6	2.2	3.2	4	278	106	5	0.49	0.05	0
15	2.8	3	1.6	2.2	3.2	4	218	104	4.8	0.22	0.01	0
16	2.1	2.2	1.6	2.4	3.2	4.2	207	92	4.5	0.1	0	0
17	1.9	2.4	1.6	2.4	3.4	4.2	226	88	4.1	0.06	0	0
18	1.8	2.6	1.6	2.4	3.4	4.2	257	86	3.4	0.09	0	0
19	1.9	2.8	1.6	2.4	3.6	4	239	82	3	0.17	0	0
20	1.8	2.8	1.8	2.4	3.6	4.4	232	76	2.5	0.06	0	0
21	3.2	2.8	1.8	2.4	3.8	4.8	298	68	2.1	0.01	0	0
22	5.6	2.6	1.8	2.4	3.8	5.2	381	65	1.8	0	0	0
23	4.7	2.4	1.8	2.4	3.6	5.4	237	61	1.5	0.23	0	0
24	4.2	2.2	1.4	2.4	3.4	6	157	56	1.4	0.27	0	0
25	4.7	2.4	1.2	2.2	3.2	6	127	48	1.2	2.7	0	0
26	4.8	2.6	1	2.2	3.2	6.4	157	42	1.1	3.4	0	0
27	3.7	2.8	1	2.2	3.4	7	201	38	1.3	2.9	0	0
28	3.2	2.8	1	2.4	3.4	8	238	35	1.5	1.8	0	0
29	2.8	2.6	1	2.6	---	9	295	33	1.3	1	0	0
30	1.8	2.4	1.2	2.6	---	10	180	30	1.4	0.67	0	0.13
31	2	---	1.2	2.4	---	11	---	26	---	2.1	0	---
TOTAL	81.28	84.7	50.6	63.8	93.2	157.8	5827	3413	206.0	28.90	20.62	0.13
MEAN	2.62	2.82	1.63	2.06	3.33	5.09	194	110	6.87	0.93	0.67	0.004
AC-FT	161	168	100	127	185	313	11560	6770	409	57	41	0.3
MAX	5.6	4.4	2.4	2.6	3.8	11	629	269	23	3.4	5.8	0.13
MIN	0.98	2.2	1	1.4	2.6	3.6	13	26	1.1	0	0	0

CAL YR	2009	TOTAL	9895.24	MEAN	27.1	MAX	358	MIN	0	AC-FT	19630
WTR YR	2010	TOTAL	10027.03	MEAN	27.5	MAX	629	MIN	0	AC-FT	19890

MAX DISCH: 964 CFS AT 22:15 ON Apr. 12,2010 GH 5.9 FT. SHIFT -0.03 FT. (GH CORR. +0.13 FT. APPLIED)
MAX GH: 5.9 FT. AT 22:15 ON Apr. 12,2010 (GH CORR. +0.13 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



RIO GRANDE RIVER BASIN
08248000 LOS PINOS RIVER NEAR ORTIZ
Water Year 2010

Location.-- Lat. 36°58'56", Long. 106°04'23", UTM X 404448.5, Y 4093440.2, on line between secs. 26 and 27, T.32 N., R.8 E., Rio Arriba County, New Mexico, Hydrologic Unit 13010005, on left bank 0.9 mi south of Colorado-New Mexico State line, 2.1 mi southwest of Ortiz, and 2.9 mi upstream from mouth.

Drainage and Period of Record.-- 167 mi². Jan. 1, 1915 to Apr. 14, 1955, water stage recorder at location 350' upstream. Apr. 15, 1955 relocated to present site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink 2 DCP with HDR GOES radio) and a shaft encoder in a 42 inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. The supplemental outside chain gage is inoperable. Cableway located 190 feet above gaging station. The Data Collection Platform was upgraded on Sep. 15, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Oct. 30, 31, Nov. 1, 15-30, Dec. 1-17, 2009, and Mar. 16-29, 2010, when the stage-discharge relation was affected by ice; Dec. 18, 2009 (when the oil cylinder started overtopping) through Mar. 15, 2010 when the well and oil cylinder were frozen, and on Sep. 15, 2010 when there was four hours of data missing due to the satellite equipment upgrade and relocation of chart recorder. Six small instrument corrections ranging from -0.02 to +0.01 feet and one +0.06 foot correction were made to the shaft encoder during the year. All small corrections were prorated by time from the previous visit. The large correction was due to the oil cylinder overtopping at higher gage heights and was applied with comparison to chart record. One flush correction of -0.02 foot was prorated from previous inflection point.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul. 1, 2010, using BM #5 as base. The RP was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 13 and Aug. 26, 2010, and no adjustments were needed or made.

Rating.-- Control is a gravel and cobble riffle approximately 300 feet below the gage. Rating No. 14.1, was used again this year. It was fairly well defined from 14 to 1210 cfs until channel work above gage during April 2010 changed approach conditions. Twenty-eight measurements (Nos. 610-637) were made this year ranging in discharge from 8.8 to 854 cfs. They cover the discharge range experienced except for the lower daily flows on Dec. 27, 28, 2009, Sep. 7, 16, 2010; and higher daily flow on May 10, 2010. The peak flow of 1160 cfs occurred at 2300 on May 9, 2010 at a gage height of 5.74 feet with a shift of +0.10 feet. It exceeded high measurement No. 627 made at a gage height of 5.11 feet on May 10, 2010 by 0.63 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. A shift curve (LOSORTVS01) was used from May 20 to Aug. 16, 2010 to apply shifts by stage. This shift curve was left open ended since the shift trend showed no indication of returning to the rating within the flow range encountered. For the remainder of the year, shifts were applied as defined by measurements and were distributed by time. Open water measurements show shifts varied between -0.02 and +0.12 ft. All measurements were given full weight and applied except Nos. 632-634, and 637, which were adjusted as much as 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of winter no gage-height and ice affected record was estimated on the basis of nine measurements, weather records, partial day records, and comparison with the nearby station "San Antonio River at Ortiz, CO." Discharge for missing hours on Sep. 15, 2010 was estimated using one measurement and taped gage-heights before and after measurement. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248000 LOS PINOS RIVER NEAR ORTIZ

RATING TABLE--

LOSORTCO14.1 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

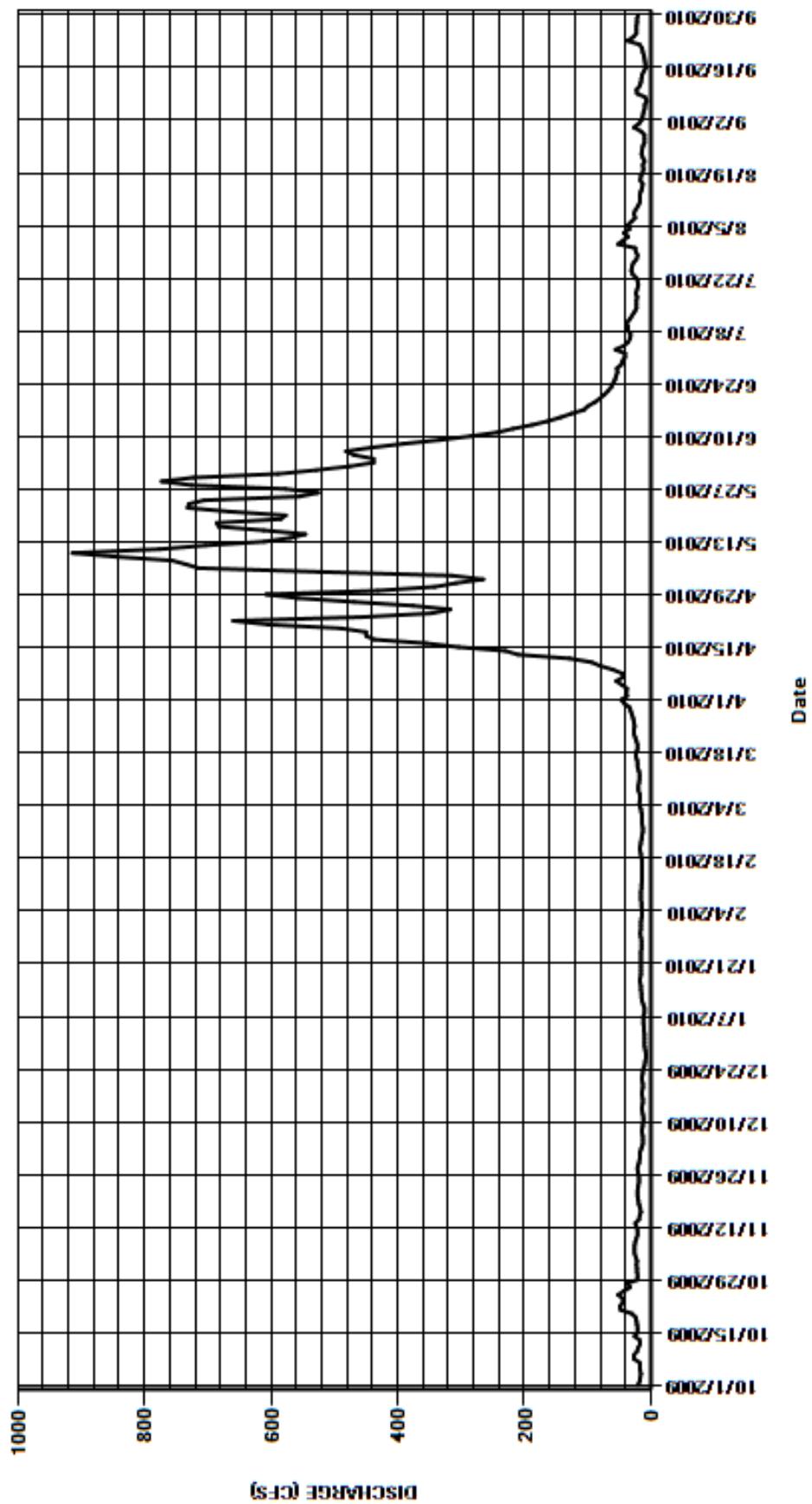
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	22	17	10	16	14	47	342	529	41	44	19
2	18	23	17	10	15	15	38	308	476	41	36	15
3	17	22	15	11	14	16	39	265	438	56	43	13
4	16	24	13	11	14	18	38	314	438	43	34	12
5	17	26	13	12	15	18	46	524	469	36	37	10
6	17	26	13	12	15	17	55	715	482	33	31	9.8
7	18	26	14	12	16	18	44	735	441	32	25	6.7
8	27	25	14	10	16	20	45	757	391	36	27	9
9	27	23	13	10	16	20	60	845	334	36	25	22
10	22	21	12	12	15	19	80	914	285	39	21	23
11	20	21	12	14	15	18	94	777	243	34	18	18
12	17	23	13	15	14	18	129	704	218	30	17	16
13	18	25	14	15	14	19	210	611	188	26	18	15
14	26	19	14	16	14	21	230	570	163	23	16	14
15	21	18	13	16	14	21	304	546	143	23	14	11
16	21	16	13	17	14	22	355	612	126	23	13	7.9
17	22	17	14	17	14	24	437	683	106	22	17	9.1
18	23	19	14	16	15	24	450	686	100	24	16	10
19	24	20	13	16	16	21	450	585	89	22	13	11
20	30	21	13	16	17	21	490	577	81	20	12	13
21	48	21	14	16	17	23	605	666	74	21	13	14
22	49	21	14	16	16	25	660	732	68	23	10	18
23	44	20	13	16	15	27	455	730	63	29	13	37
24	44	19	12	16	14	27	345	706	60	31	15	28
25	52	19	10	15	13	26	317	555	57	30	14	23
26	43	20	9	15	13	27	376	526	55	28	13	23
27	33	21	8	15	14	28	469	578	53	23	10	23
28	38	21	8	16	14	30	557	726	54	21	10	22
29	21	19	9	17	---	32	608	773	47	24	10	22
30	21	18	10	16	---	34	431	723	45	25	16	20
31	22	---	10	16	---	42	---	589	---	52	27	---
TOTAL	837	636	391.0	442	415	705	8464	19374	6316	947	628	494.5
MEAN	27	21.2	12.6	14.3	14.8	22.7	282	625	211	30.5	20.3	16.5
AC-FT	1660	1260	776	877	823	1400	16790	38430	12530	1880	1250	981
MAX	52	26	17	17	17	42	660	914	529	56	44	37
MIN	16	16	8	10	13	14	38	265	45	20	10	6.7
CAL YR	2009	TOTAL	47801.0	MEAN	131	MAX	1350	MIN	8	AC-FT	94810	
WTR YR	2010	TOTAL	39649.5	MEAN	109	MAX	914	MIN	6.7	AC-FT	78640	

MAX DISCH: 1160 CFS AT 23:00 ON May.09,2010 GH 5.74 FT. SHIFT 0.1 FT.

MAX GH: 5.74 FT. AT 23:00 ON May.09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248000 LOS PINOS RIVER NEAR ORTIZ
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08248500 SAN ANTONIO RIVER NEAR MANASSA
Water Year 2010

Location.-- Lat. 37°10'38", Long. 105°52'35", UTM X 422052.9, Y 4114863.9, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, T.34 N., R.10 E., Conejos County, Hydrologic Unit 13010005, on right bank 0.3 mi. downstream from bridge on State Highway 142, 2.2 mi. upstream from mouth, and 3.3 mi. east of Manassa, Co.

Drainage and Period of Record.-- 348 mi².

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio) and a float-operated shaft encoder in metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Only change this water year was the installation of a tipping bucket rain gage on Nov. 2, 2009.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 23 to Dec. 2, 2009, when the stage-discharge relation was affected by ice; Dec. 17, 2009 through March 29, 2010 when the station was closed for the winter, and Dec. 3-16, 2009, Apr. 2, 3, 2010 when ice in well was affecting floats. There was no flow Oct. 1-7, 2009, Jul. 30, Aug. 5 - Sep. 30, 2010 (65 days). There were two trash corrections; a -0.04 ft. on Jul. 15 and a -0.16 ft. on Jul. 28, 2010. Both were distributed through the obvious affected periods. There is some uncertainty in each of these corrected mean measurement gage-heights due to removing trash after measuring. There were two shaft encoder corrections; a -0.01 ft. on May 11, and a +0.01 ft. on Jun. 17, 2010. Both corrections were prorated from previous visit.

Datum Corrections.-- Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage Aug. 12, 2009 using BM #4 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Rating No. 20B was created and used for this water year. Rating 20B was developed based on recent measurements along with measurement #83, the highest measurement on record since 1996. The low flow control is a gravel riffle approximately 150 ft. below gage, this feature is the control up to a stage of approximately 2.0 ft where the control transitions to channel control up to a stage of approximately 3.00 ft. From 3.00 ft to 5.02 ft. the control is channel control (rating slope less than 2.0 ft.) and above 5.02 ft. is transitioning to overbank flow. The upper end of rating 20, (6.8 ft, 1430 cfs) was determined using measurements #83 (+0.4%), 263 (-4.8%), 280 (0.9%), 264 (-9.8%), 262 (+1.8%), 299 (-0.2%), and 281 (-0.8%) and differs from the upper end of rating 19B (6.8 ft, 1980 cfs) by -28 percent. The reduction in flows at the upper end is verified by the increased number of high flow measurements from 2008, 2009, and 2010 that were not available for the development of rating 19B. Medium flows (stage above 2.08 ft) were defined using measurements from 2009 and 2010 WY, low flows (stage below 2.08 ft) were defined using measurements from the 2010 WY and a measured pzf of 1.20 ft. Nineteen measurements (Nos. 289-307) were made this year, ranging in discharge from 0 to 758 cfs. They cover the discharge range experienced except for the higher daily flow on May 10, 2010. The peak flow of 893 cfs occurred at 1715 on May 10, 2010 at a gage height of 5.83 feet (-0.01 ft. gage height correction applied) with a shift of 0 feet. It exceeded high measurement No. 299 (GH=5.49), made on May 11, 2010 by 0.34 ft. in stage.

Discharge.-- Shifting control method was used during all open water periods. Shifts were applied as defined by discharge measurements and distributed by time. This year's measurements show shifts varied between -0.10 and +0.02 ft. All were given full weight except Nos. 298, which was adjusted 2% and 303, which was adjusted by 7% to smooth shift distribution.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using five measurements, weather records, partial day records, and comparison with nearby stations. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor; and the period from Jul. 15 to Aug. 4, 2010 due to uncertainty in corrected mean measurement gage-heights, which is fair. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248500 SAN ANTONIO RIVER NEAR MANASSA

RATING TABLE--

SANMANCO20B USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

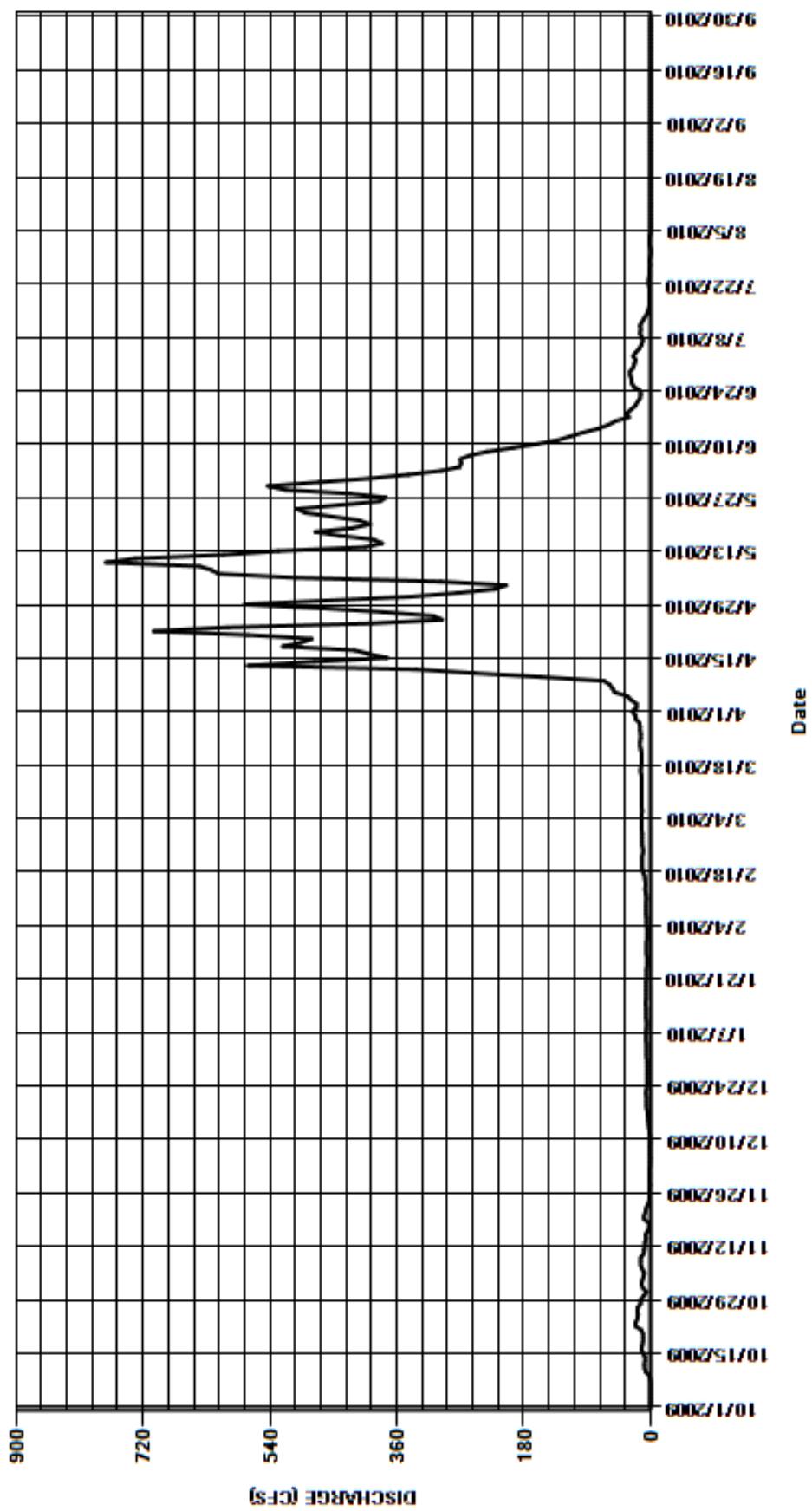
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	11	1.5	6	5	13	26	341	398	23	1.3	0
2	0	13	1.5	6	5	13	20	274	344	21	1.5	0
3	0	12	1	6	5	13	20	221	297	25	1.8	0
4	0	10	1	6	6	13	28	205	271	21	0.37	0
5	0	9	0.5	6.5	6	13	33	298	269	16	0	0
6	0	12	1	6.5	6	12	51	504	270	13	0	0
7	0	14	1	6.5	6.5	13	54	613	257	11	0	0
8	0.45	14	1	6	6.5	13	58	623	232	13	0	0
9	1.4	14	0.5	5.5	6.5	13	66	640	195	15	0	0
10	6.8	10	0.5	6	6.5	13	156	773	161	14	0	0
11	8.4	9.1	1	6.5	6	13	249	731	132	15	0	0
12	8.7	8.7	1.5	6.5	6.5	13	333	606	114	12	0	0
13	8.1	8	2.5	6.5	7.5	13	571	528	96	8.9	0	0
14	8	6.6	3	7	7.5	13	477	405	75	5.2	0	0
15	11	7.3	3.5	7	7	13	374	381	60	3.2	0	0
16	13	4.1	4	6.5	8	14	399	393	50	1.9	0	0
17	12	2.1	4.5	6.5	8.5	14	420	441	31	1.3	0	0
18	11	2.1	5.5	6.5	11	13	522	476	34	1.2	0	0
19	11	9.1	6	6.5	12	13	496	423	28	1.4	0	0
20	11	9	6	6.5	12	13	481	398	22	1.2	0	0
21	13	7.5	6	6	12	13	572	414	19	1.9	0	0
22	21	6	6.5	6	12	14	705	452	15	3.1	0	0
23	21	3.5	6	6	11	15	600	490	14	2.6	0	0
24	19	2	5	5.5	11	15	397	502	15	1.9	0	0
25	18	1.5	5	5	12	14	296	443	24	1.7	0	0
26	19	1.5	5	5	12	14	308	384	27	1.4	0	0
27	18	1.5	5	5.5	12	15	380	376	27	0.94	0	0
28	14	1	5	6	12	15	466	426	29	1.5	0	0
29	14	1.5	5	6	---	16	576	518	29	0.74	0	0
30	9.4	1.5	5	6	---	21	462	543	25	0	0	0
31	5.8	---	5.5	5.5	---	22	---	470	---	0.01	0	---
TOTAL	283.05	212.6	106.00	189.5	239.0	435	9596	14292	3560	239.09	4.97	0.00
MEAN	9.13	7.09	3.42	6.11	8.54	14	320	461	119	7.71	0.16	0
AC-FT	561	422	210	376	474	863	19030	28350	7060	474	9.9	0
MAX	21	14	6.5	7	12	22	705	773	398	25	1.8	0
MIN	0	1	0.5	5	5	12	20	205	14	0	0	0
CAL YR	2009	TOTAL	41248.29	MEAN	113	MAX	1330	MIN	0	AC-FT	81820	
WTR YR	2010	TOTAL	29157.21	MEAN	79.9	MAX	773	MIN	0	AC-FT	57830	

MAX DISCH: 893 CFS AT 17:15 ON May. 10,2010 GH 5.83 FT. SHIFT 0 FT. (GH CORR. -0.01 FT. APPLIED)
MAX GH: 5.83 FT. AT 17:15 ON May. 10,2010 (GH CORR. -0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248500 SAN ANTONIO RIVER NEAR MANASSA
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2010

Location.-- Lat. 37°18'01", Long. 105°44'47", UTM X 433750.8, Y 4128508.4, in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 35 N., R. 11 E., Conejos County, on left bank of main channel 125 ft downstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of LaSause, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi². Water stage recorder since March 29, 1921 at five sites close to present location.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio) and a float-operated shaft encoder and air temperature sensor in a four foot square timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. The cableway is located 100 feet below gaging station. The supplementary outside chain gage is no longer operational. The Sutron 8210 DCP was replaced with a Sutron Satlink2 and the shaft encoder was replaced with a Sutron SDR on Aug. 19, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 24-25, Dec. 3-31, 2009, and Jan. 1-6, 8-13, 23-27, Mar. 20-21, 24-25, 2010, when the stage-discharge relation was affected by ice; and, Apr. 13-14, when float was hitting winter floor. There were two small flush corrections found on Mar. 15, 2010 and May 10, 2010. They were distributed by time using gage-height trend. No instrument corrections were needed.

Datum Corrections.-- Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage on Jul. 28, 2009 using B.M. No. 3 as base. The RP was within allowable limits, so a correction was not made.

Rating.-- Control is a gravel bar approximately 150 ft. below the gage at medium and low flows, and the channel at high flows. At low flows the water splits into two channels at the control section. The bank, willows, and high water in the Rio Grande influence gage height during very high flows. Rating No. 15, in use since Jan. 3, 2006, was used until December 31, 2009. Rating No. 16 was put into use January 1, 2010. Considering the variability of control section, the rating is fairly well defined from 0 to 1730 cfs. Twenty-eight measurements (Nos. 242-269) were made this year ranging in discharge from 0 to 707 cfs. The measurements cover the range experienced except for higher daily flows on Apr. 14, 18-24, May 29 – Jun. 1, 2010. They cover 63 percent of the total daily discharge range experienced this year. The peak flow of 1210 cfs occurred at 0130 on April 23, 2010 at a gage height of 5.62 feet with a shift of +0.01 feet. It exceeded high measurement No. 259 (GH = 4.64), made June 1, 2010, by 0.98 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Two different shift curves were used throughout the year to define the stage-shift relationship. Shift curve NORLASVS1001 was used from Oct. 1 to Dec. 31, 2009 with rating 15. Shift curve NORLASVS1002 was used from Apr. 1 to Jul. 1, 2010 with rating 16. These curves were left open-ended since difference was within 0.01 ft of the rating and is within allowable tolerances for the range of discharges experienced. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts ranged from +0.02 ft. to +0.10 feet, for measurements prior to Dec. 31, 2009 on rating 15. For measurements after Dec. 31, 2009 the measured shifts ranged from -0.08 ft to +0.06 feet on rating 16. All measurements were given full weight and applied except Nos. 244, 246, 252, 254-256, and 258, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.-- Discharge during periods of no gage-height and ice affected record was estimated using two measurements, weather records, partial record days, and comparison with the South Channel Conejos River near LaSause gage. Water was diverted from stream prior to Dec. 12, 2009 to simplify construction of new diversion structure above gage. Estimates were adjusted accordingly. Apr. 13, 14, 2010 were estimated because the float hit the bottom of the winter floor. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Andrea C. Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE--

NORLASCO15 USED FROM 01-Oct-2009 TO 31-Dec-2009
NORLASCO16 USED FROM 01-Jan-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

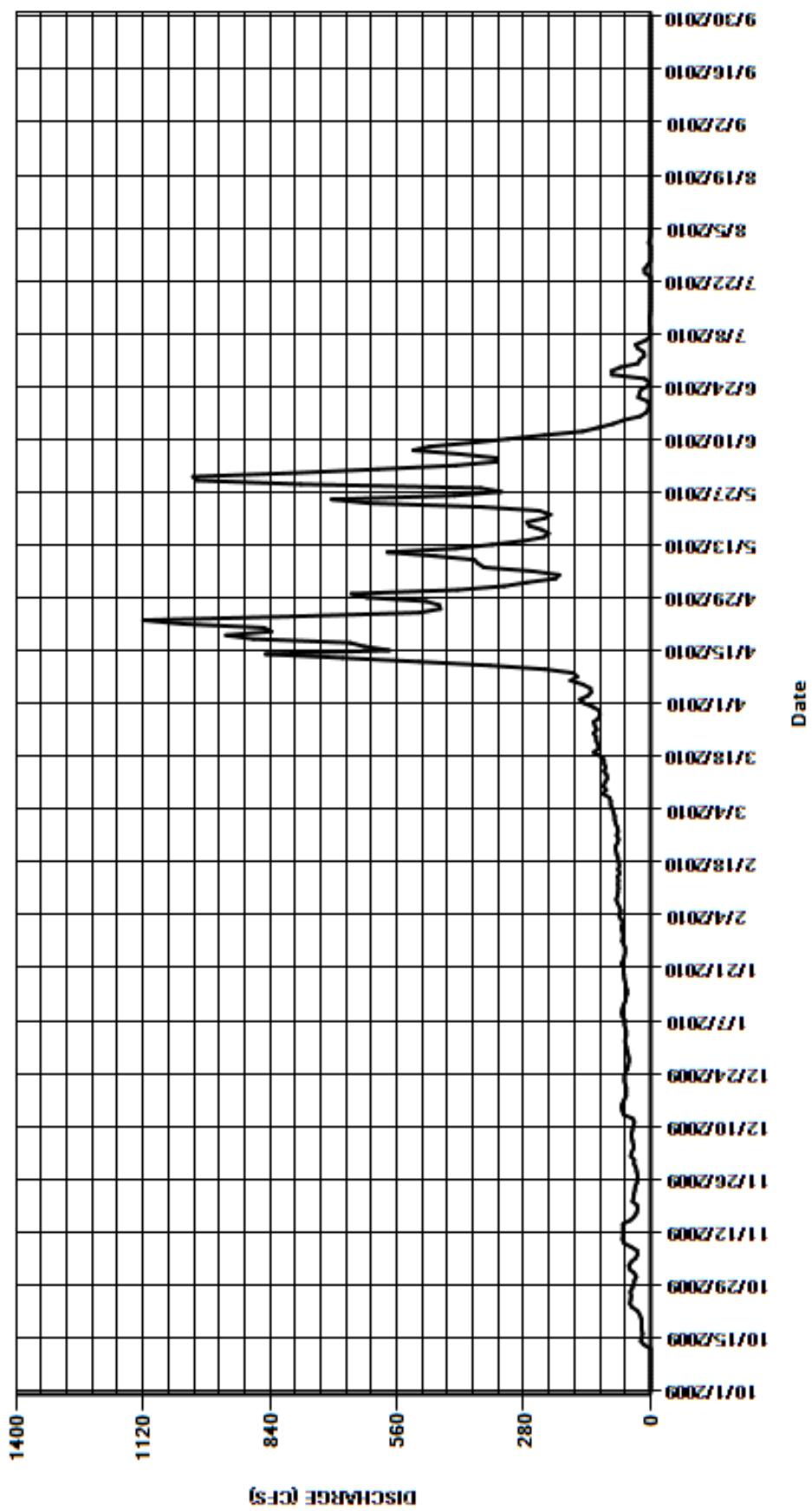
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	36	36	56	64	79	147	426	785	24	4	0
2	0	46	44	56	61	79	156	324	602	14	1.7	0
3	0	48	42	54	67	82	138	273	430	15	0.29	0
4	0	43	38	54	70	84	131	210	338	28	0.09	0
5	0	33	38	56	66	88	133	202	342	33	0.01	0
6	0	29	40	58	69	88	150	262	420	13	0	0
7	0	30	42	57	73	91	177	368	524	1.8	0	0
8	0	44	42	62	76	106	162	381	487	1	0	0
9	0	59	40	64	73	98	170	389	395	1.1	0	0
10	0	62	38	62	72	104	233	475	315	1.7	0	0
11	0	61	36	60	71	101	355	581	234	3	0	0
12	0	61	40	56	72	96	511	430	150	2.7	0	0
13	14	61	60	55	71	97	680	350	116	1.3	0	0
14	22	61	62	52	73	103	850	281	83	0.6	0	0
15	19	45	65	52	68	99	577	236	60	0.39	0	0
16	18	36	62	55	72	103	631	225	23	0.25	0	0
17	20	31	58	56	69	103	663	241	10	0.13	0	0
18	20	29	54	58	71	111	876	268	4.6	0.16	0	0
19	20	30	54	59	72	126	937	273	3.5	0.11	0	0
20	21	40	54	60	75	114	837	234	6.7	0.06	0	0
21	24	38	56	60	77	116	854	221	27	0.06	0	0
22	29	37	58	65	78	120	1030	246	25	0.05	0	0
23	41	35	58	60	73	120	1120	373	22	0.02	0	0
24	46	34	56	58	71	126	786	622	6.9	13	0	0
25	44	30	52	56	75	119	510	704	2.5	14	0	0
26	43	29	50	56	72	123	464	433	14	7.4	0	0
27	45	29	48	59	73	126	467	330	85	0.82	0	0
28	41	31	48	63	77	115	496	375	86	0.24	0	0
29	37	33	50	61	---	112	625	772	67	0.06	0	0
30	36	37	52	61	---	113	660	1000	28	0	0	0
31	32	---	54	64	---	127	---	1010	---	0.05	0	---
TOTAL	572.00	1218	1527	1805	2001	3269	15526	12515	5692.2	177.00	6.09	0.00
MEAN	18.5	40.6	49.3	58.2	71.5	105	518	404	190	5.71	0.2	0
AC-FT	1130	2420	3030	3580	3970	6480	30800	24820	11290	351	12	0
MAX	46	62	65	65	78	127	1120	1010	785	33	4	0
MIN	0	29	36	52	61	79	131	202	2.5	0	0	0

CAL YR	2009	TOTAL	66314.59	MEAN	182	MAX	1400	MIN	0	AC-FT	131500
WTR YR	2010	TOTAL	44308.29	MEAN	121	MAX	1120	MIN	0	AC-FT	87890

MAX DISCH: 1210 CFS AT 01:30 ON Apr. 23,2010 GH 5.62 FT. SHIFT 0.01 FT.
MAX GH: 5.62 FT. AT 01:30 ON Apr. 23,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2010

Location.-- Lat. 37°18'01", Long. 105°44'47", UTM X 433744.8, Y 4127737.3, in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, T. 35 N., R. 11 E., Conejos County, on left bank of secondary channel 230 ft upstream from bridge on State Route 158, 1.0 mi upstream from mouth, 1.5 mi north of LaSauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi². Water stage recorder since March 29, 1921 at various sites close to present location.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink DCP with HDR GOES radio) and a float-operated shaft encoder in a 42 inch metal pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this water year.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 2, 2009 through Jan. 8, 2010, when the stage-discharge relation was affected by ice; Jan. 9 through Mar. 14, 2010 when floats were affected by ice in well; and Mar. 15-21, 2010 when the inlets were frozen. There was no flow Oct. 1-24, 2009, Jul. 19-24, Jul. 29 through Aug. 1, and Aug. 4 through Sept. 30, 2010 (92 days). There were no instrumentation corrections made to the shaft encoder during the year. There was one large trash correction applied as a datum correction starting May 30, 2010 when a log caught on the control and continuing to June 1, 2010 when the log was removed from the control. This correction was identified by trend comparison with North Channel Conejos River near La Sauses.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Oct. 26, 2009 using BM No. 8 as base and again on Jul. 13, 2010 using BM No. 9 as base. The gage was within allowable limits and no correction was made to the RP. Two-peg tests were performed on the Lietz level (SN 130869) on July 13, 2010 and August 26, 2010 and no adjustments were needed or made. An adjustment to instrument collimation was made on August 26, 2009. The new BM 8 was abandoned due to instability and needs to be repaired or replaced

Rating.-- The control is a steel sheet piling weir with a low flow notch. Rating No. 9 in use from Mar. 21, 2008 was used again this year. It is well defined from 0 to 379 cfs. Twenty-six measurements (Nos. 404-429) were made this year ranging in discharge from 0 to 25.9 cfs. They cover the daily discharge range experienced this year except for higher flows on Apr. 14, 18-24, May 29 – Jun 1. The peak flow of 133 cfs occurred at 0600 on May 31, 2010 at a gage height of 2.94 feet (gage height correction of -0.06 ft. applied) with a shift of 0.04 feet. It exceeded high measurement No. 421 (GH = 2.19), made June 1, 2010, by 0.75 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. Shifts were applied as defined by discharge measurements and distributed by time. The shifting was fairly consistent from measurement to measurement with measurement shifts ranging from -0.01 ft to +0.07 ft. All measurements were given full weight except Nos. 408, 417, 418, 419, 422, and 424 which were adjusted as much as 12 percent to smooth shift distribution. The shifts likely result from filling in the gage pool causing the weir to be more efficient.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using seven measurements, weather records, partial record days, and comparison with the North Channel of the Conejos River near LaSauses. A hydrograph was used.

Remarks.-- Record is good except for periods of no gage-height and ice affected record, and the period from May 20 to Jun 1, 2010 due to uncertainty in distribution of trash corrections, which should be considered fair. Station maintained by Div 3 hydrographic staff and record developed by Andrea Taillacq.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE--

SOULASCO09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

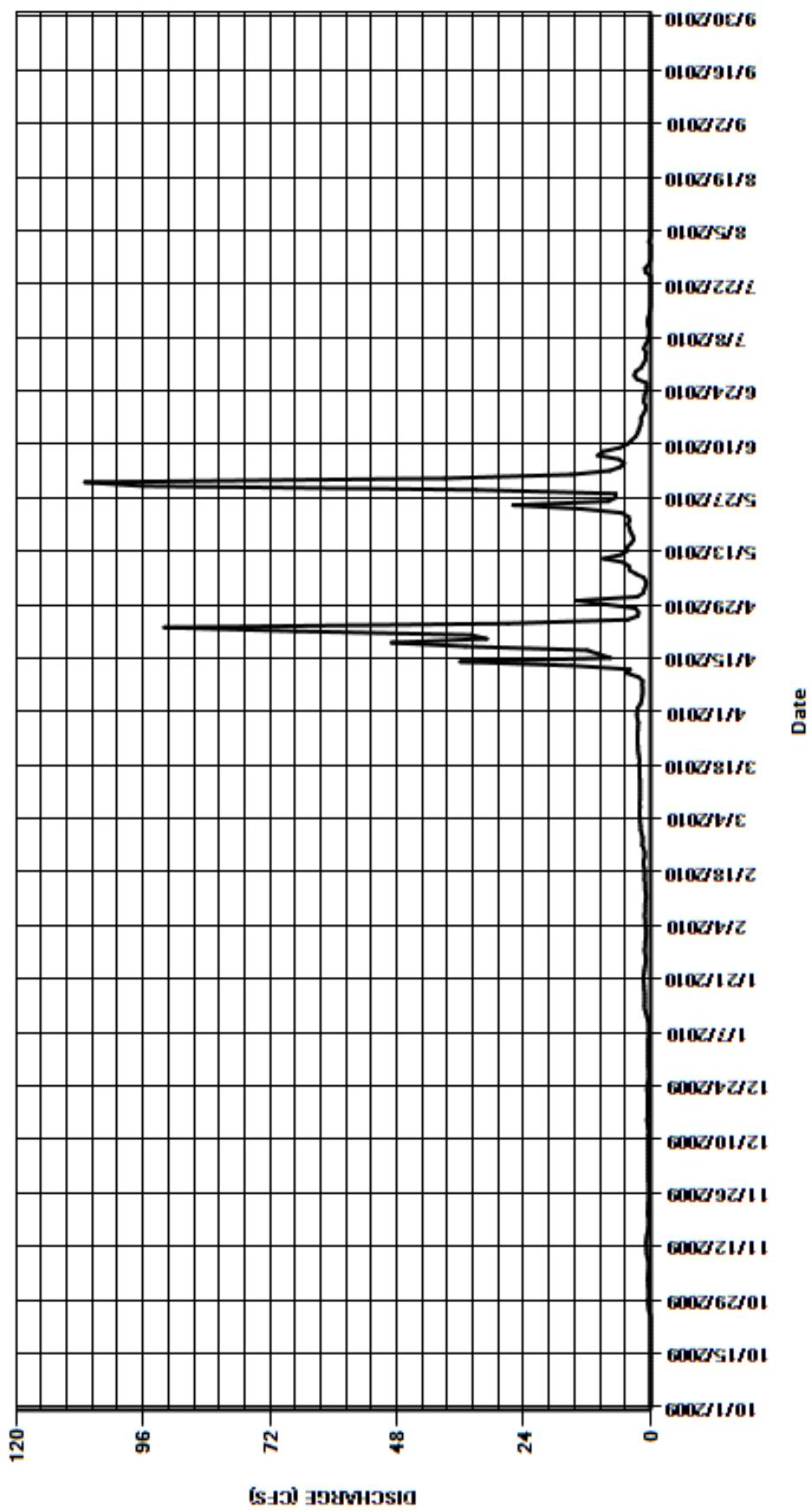
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0.44	0.51	0.5	0.9	1.9	2.6	2.5	39	1.4	0	0
2	0	0.49	0.5	0.5	0.9	1.9	2.4	1.4	15	1	0.31	0
3	0	0.56	0.5	0.5	0.9	2	1.9	1.2	7.7	0.96	0.05	0
4	0	0.54	0.5	0.5	1	2	1.7	0.9	5.7	0.87	0	0
5	0	0.46	0.5	0.5	1	2.1	1.6	0.89	5	1.3	0	0
6	0	0.41	0.5	0.4	1.1	2.1	1.5	1.3	6	1	0	0
7	0	0.38	0.5	0.4	1.1	2	1.5	2.8	10	0.56	0	0
8	0	0.41	0.5	0.4	1	2.1	1.6	4	9.1	0.38	0	0
9	0	0.64	0.5	0.4	1	2	1.5	4.1	5.9	0.32	0	0
10	0	0.76	0.5	0.5	1	2	2.3	5.1	4.4	0.29	0	0
11	0	0.75	0.5	0.7	0.9	2	4.5	8.9	3.6	0.51	0	0
12	0	0.88	0.4	0.9	0.9	2	3.9	5.6	2.8	0.56	0	0
13	0	0.88	0.5	1.1	1	2	15	4.5	2.4	0.46	0	0
14	0	0.78	0.6	1.2	1	2	36	4.4	2.2	0.24	0	0
15	0	0.7	0.7	1.1	1	2.1	7.6	3.7	1.9	0.12	0	0
16	0	0.51	0.6	1.1	1.2	2.1	9.9	3.2	1.8	0.04	0	0
17	0	0.44	0.6	1.1	1.1	2.1	12	3.4	1.8	0.01	0	0
18	0	0.42	0.6	1.2	1.1	2.2	35	3.8	1.3	0.01	0	0
19	0	0.4	0.6	1.2	1.2	2.1	49	4	0.99	0	0	0
20	0	0.53	0.6	1.3	1.4	2.2	31	4.3	0.91	0	0	0
21	0	0.55	0.6	1.3	1.3	2.3	34	4	1.3	0	0	0
22	0	0.52	0.6	1.3	1.1	2.4	67	4.2	1.2	0	0	0
23	0	0.49	0.7	1.2	1.1	2.4	92	5.6	1.1	0	0	0
24	0	0.43	0.7	1.1	1.3	2.5	27	13	0.81	0	0	0
25	0.06	0.39	0.5	1	1.6	2.5	4.3	26	0.77	1	0	0
26	0.32	0.39	0.4	0.9	1.5	2.5	2.4	8	0.79	1.1	0	0
27	0.42	0.39	0.4	1	1.5	2.4	2.3	6.6	2.6	0.36	0	0
28	0.46	0.4	0.4	1.1	1.7	2.4	2.9	6.6	3.1	0.07	0	0
29	0.46	0.46	0.5	1.1	---	2.3	8.4	33	2.8	0	0	0
30	0.43	0.48	0.5	1	---	2.5	14	96	1.8	0	0	0
31	0.43	---	0.5	1	---	2.6	---	107	---	0	0	---
TOTAL	2.58	15.88	16.51	27.50	31.80	67.7	476.8	379.99	143.77	12.56	0.36	0.00
MEAN	0.083	0.53	0.53	0.89	1.14	2.18	15.9	12.3	4.79	0.41	0.012	0
AC-FT	5.1	31	33	55	63	134	946	754	285	25	0.7	0
MAX	0.46	0.88	0.7	1.3	1.7	2.6	92	107	39	1.4	0.31	0
MIN	0	0.38	0.4	0.4	0.9	1.9	1.5	0.89	0.77	0	0	0
CAL YR	2009	TOTAL	1527.24	MEAN	4.18	MAX	161	MIN	0	AC-FT	3030	
WTR YR	2010	TOTAL	1175.45	MEAN	3.22	MAX	107	MIN	0	AC-FT	2330	

MAX DISCH: 133 CFS AT 06:00 ON May. 31,2010 GH 2.94 FT. SHIFT 0.04 FT. (GH CORR. -0.06 FT. APPLIED)

MAX GH: 2.94 FT. AT 06:00 ON May. 31,2010 (GH CORR. -0.06 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
Water Year 2010

Location.-- Lat 37°18'01", long 105°44'47", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10 (two channels), T.35 N., R.II E., Conejos County, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Highway 158 and on left bank of secondary channel 230 ft upstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of Lasauses, and 13 mi southeast of Alamosa.

Drainage and Period of Record.-- 887 mi 2 . Mar. 1921, water stage recorders, at several locations close to present sites.

Equipment.-- See individual records for gage equipment descriptions.

Hydrologic Conditions.--

Gage-Height Record.-- See individual station analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding the individual station daily discharges. A day is considered estimated if the estimated portion of a daily sum is greater than 10% of the daily sum. The following days were considered estimated: Nov. 24, 25, Dec. 3-31, 2009, Jan. 1-6, 8-13, 23-27, Mar. 20, 21, 24, 25, Apr. 13, 14, 2010.

Special Computations.--

Remarks.-- Record is good except for periods of estimated record, which are poor. Record developed by D. Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

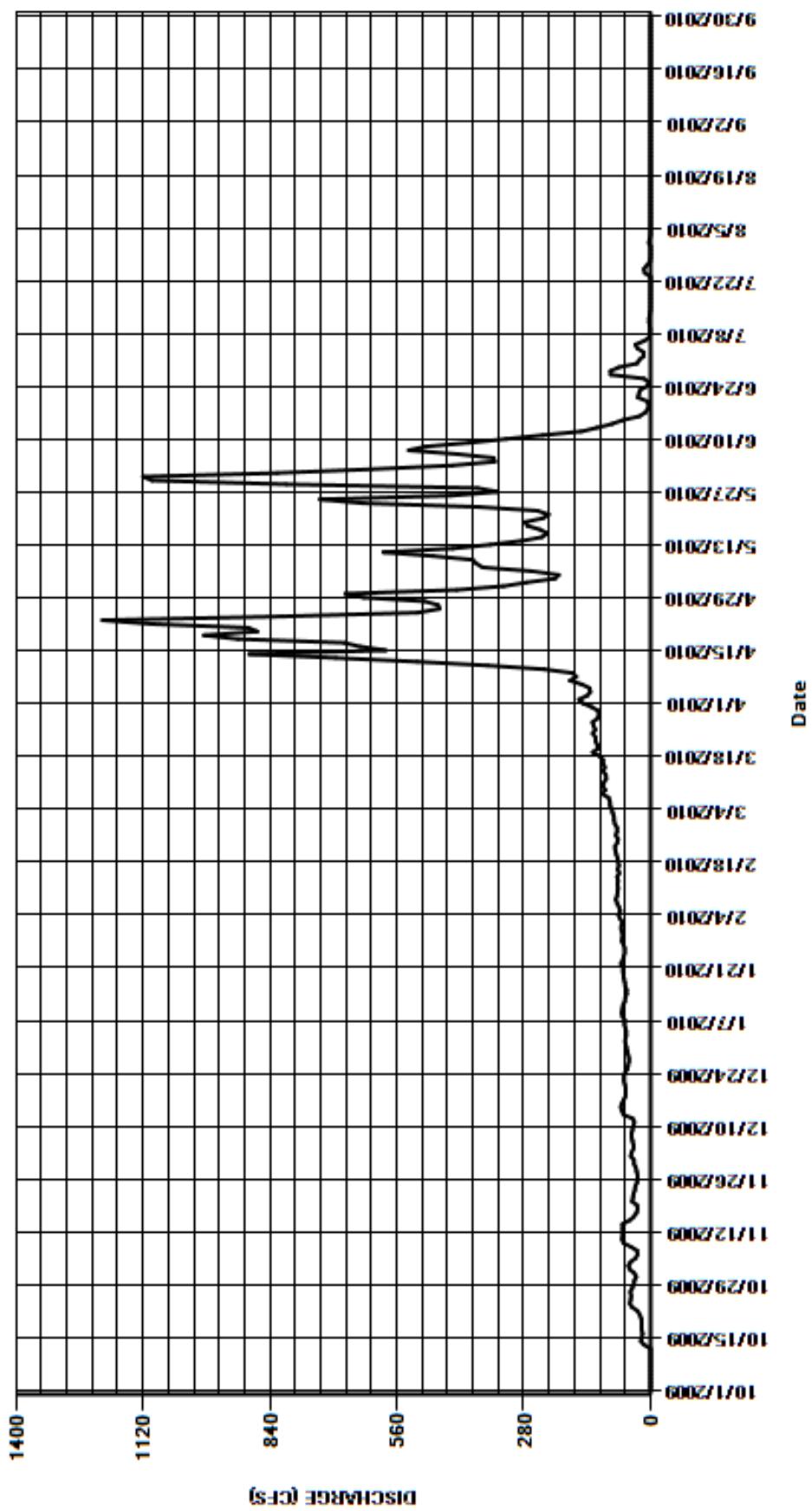
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	36	37	56	65	81	150	428	824	25	4	0
2	0	46	44	56	62	81	158	325	617	15	2	0
3	0	49	42	54	68	84	140	274	438	16	0.34	0
4	0	44	38	54	71	86	133	211	344	29	0.09	0
5	0	33	38	56	67	90	135	203	347	34	0.01	0
6	0	29	40	58	70	90	152	263	426	14	0	0
7	0	30	42	57	74	93	178	371	534	2.4	0	0
8	0	44	42	62	77	108	164	385	496	1.4	0	0
9	0	60	40	64	74	100	172	393	401	1.4	0	0
10	0	63	38	62	73	106	235	480	319	2	0	0
11	0	62	36	61	72	103	360	590	238	3.5	0	0
12	0	62	40	57	73	98	515	436	153	3.3	0	0
13	14	62	60	56	72	99	695	354	118	1.8	0	0
14	22	62	63	53	74	105	886	285	85	0.84	0	0
15	19	46	66	53	69	101	585	240	62	0.51	0	0
16	18	37	63	56	73	105	641	228	25	0.29	0	0
17	20	31	59	57	70	105	675	244	12	0.14	0	0
18	20	29	55	59	72	113	911	272	5.9	0.17	0	0
19	20	30	55	60	73	128	986	277	4.5	0.11	0	0
20	21	41	55	61	76	116	868	238	7.6	0.06	0	0
21	24	39	57	61	78	118	888	225	28	0.06	0	0
22	29	38	59	66	79	122	1100	250	26	0.05	0	0
23	41	35	59	61	74	122	1210	379	23	0.02	0	0
24	46	34	57	59	72	128	813	635	7.7	13	0	0
25	44	30	52	57	77	122	514	730	3.3	15	0	0
26	43	29	50	57	74	126	466	441	15	8.5	0	0
27	45	29	48	60	74	128	469	337	88	1.2	0	0
28	41	31	48	64	79	117	499	382	89	0.31	0	0
29	37	33	50	62	---	114	633	805	70	0.06	0	0
30	36	37	52	62	---	116	674	1100	30	0	0	0
31	32	---	54	65	---	130	---	1120	---	0.05	0	---
TOTAL	572.00	1231	1539	1826	2032	3335	16005	12901	5837.0	189.17	6.44	0.00
MEAN	18.5	41	49.6	58.9	72.6	108	534	416	195	6.1	0.21	0
AC-FT	1130	2440	3050	3620	4030	6610	31750	25590	11580	375	13	0
MAX	46	63	66	66	79	130	1210	1120	824	34	4	0
MIN	0	29	36	53	62	81	133	203	3.3	0	0	0
CAL YR	2009	TOTAL	67819.79	MEAN	186	MAX	1560	MIN	0	AC-FT	134500	
WTR YR	2010	TOTAL	45473.61	MEAN	125	MAX	1210	MIN	0	AC-FT	90200	

MAX DISCH: N/A--see records for individual gages

MAX GH: FT. N/A--see records for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08250000 CULEBRA CREEK AT SAN LUIS
Water Year 2010

Location.-- Lat. 37°11'01", Long. 105°25'31", UTM X 462202.3, Y 4115356.8, Costilla County, Hydrologic Unit 13010002, in Beaubien Grant, on left bank at bridge 1.0 mi. south of San Luis and 1.0 mi. upstream from Rito Seco.

Drainage and Period of Record.-- 220 mi². Station established April 1, 1927 by Colo. State Engineer's Office at present site, different datum. May 1931 new flume installed and datum established at the same site.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger with HDR GOES radio), and a float-operated shaft encoder in a metal shelter and rock well. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage. No change.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year. There were no instrument corrections made to the shaft encoder during the year. Some large cobbles were found and removed from the approach section resulting in a +0.02 ft change in gage-height on Sep. 29, 2010. Therefore, a +0.02 ft correction was distributed straight back to an event on Sep. 23, 2010.

Datum Corrections.-- Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 16, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, so no correction was made.

Rating.-- Control is a non-standard 12-ft. concrete Parshall flume. Gravel and moss in flume, changes in approach velocity, and debris cause shifting. Rating No. 6 was used again this year. It is fairly well defined from 9 to 380 cfs, but due to few measurements within the range of 40 to 80 cfs, it is difficult to evaluate this range. Seventeen measurements (Nos. 230-246) were made this year ranging in discharge from 15.1 to 111 cfs. Measurements cover the range experienced except for higher daily flows on Jun. 3-6, 9-15, Jul. 6, 14, 15, 18-20, 2010. The peak flow of 133 cfs occurred at 1230 on June 14, 2010 at a gage height of 1.68 feet with a shift of 0.00 feet. It exceeded high measurement No. 241 (GH=1.49 ft.) made June 15, 2010 by 0.19 ft. in stage.

Discharge.-- Shifting control method was used for all periods. Shifts were applied as defined by measurements and were distributed by time. Measured shifts varied between -0.05 and +0.04 ft. All were given full weight except Nos. 230, 234, 236, 237, 239, 242, 244, and 245, which were adjusted as much as 5% to smooth shift distribution.

Special Computations.--

Remarks.-- Record is good. During the winter the record may show a pattern of jagged peaks in the late morning hours. While this pattern does appear to be ice affected record, it has been verified by the hydrographic staff of Division 3 that this is caused by ice dams releasing water above the gage, and that this is good record. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08250000 CULEBRA CREEK AT SAN LUIS

RATING TABLE--

CULSANCO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

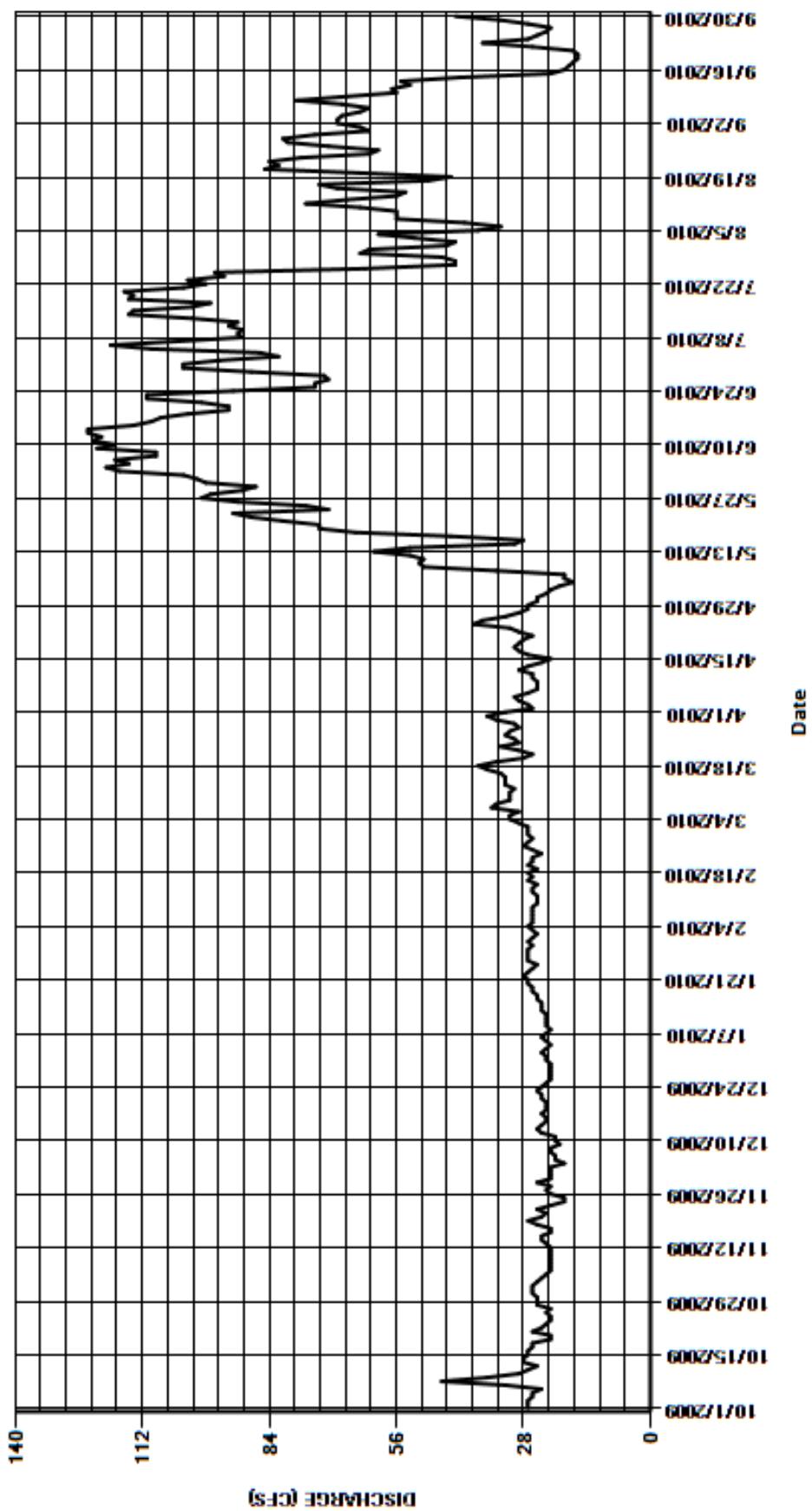
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	26	22	23	26	27	32	25	100	103	45	64
2	27	26	22	24	25	27	26	23	103	95	43	69
3	27	25	22	23	26	29	27	22	117	82	52	69
4	26	24	19	22	27	31	29	20	120	86	60	68
5	26	23	21	23	26	31	30	17	115	110	38	64
6	24	22	21	24	26	29	27	19	118	119	33	62
7	32	22	22	23	26	35	25	19	109	104	41	68
8	46	22	22	22	26	34	25	34	109	90	56	78
9	36	22	20	23	26	31	25	50	122	91	56	67
10	29	22	21	23	25	31	26	51	118	90	56	56
11	27	22	21	23	25	31	26	50	123	93	64	57
12	25	22	24	23	25	30	29	53	121	91	76	53
13	28	23	25	24	26	32	27	61	124	101	67	55
14	28	24	24	24	26	32	24	53	124	115	56	42
15	27	24	23	24	25	32	22	30	114	114	54	22
16	27	22	23	25	27	33	27	28	110	101	69	19
17	26	22	24	25	26	36	29	44	108	97	73	18
18	26	25	23	26	27	38	30	65	102	115	49	17
19	22	27	23	26	25	34	29	73	93	114	44	16
20	22	24	23	27	27	28	28	73	93	116	64	16
21	26	23	24	27	26	26	26	81	99	103	85	17
22	24	25	24	28	26	29	29	88	111	98	82	26
23	23	22	25	27	24	33	31	92	111	102	84	37
24	22	19	24	26	26	29	39	71	92	94	77	27
25	22	19	23	25	28	30	37	76	74	96	62	25
26	23	22	22	27	27	32	32	91	74	63	60	23
27	22	23	22	27	26	31	29	99	71	43	71	22
28	25	22	22	27	27	29	27	97	72	43	80	27
29	25	25	22	27	---	30	27	90	88	46	81	33
30	25	22	22	26	---	34	25	87	103	64	74	43
31	26	---	23	27	---	36	---	98	---	62	62	---
TOTAL	821	691	698	771	728	970	845	1780	3138	2841	1914	1260
MEAN	26.5	23	22.5	24.9	26	31.3	28.2	57.4	105	91.6	61.7	42
AC-FT	1630	1370	1380	1530	1440	1920	1680	3530	6220	5640	3800	2500
MAX	46	27	25	28	28	38	39	99	124	119	85	78
MIN	22	19	19	22	24	26	22	17	71	43	33	16
CAL YR	2009	TOTAL	15415	MEAN	42.2	MAX	122	MIN	19	AC-FT	30580	
WTR YR	2010	TOTAL	16457	MEAN	45.1	MAX	124	MIN	16	AC-FT	32640	

MAX DISCH: 133 CFS AT 12:30 ON Jun. 14,2010 GH 1.68 FT. SHIFT 0 FT.

MAX GH: 1.68 FT. AT 12:30 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08250000 CULEBRA CREEK AT SAN LUIS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
08251500 RIO GRANDE RIVER NEAR LOBATOS
Water Year 2010

Location.-- Lat. 37°04'43", Long. 105°45'23", UTM X 432718.9, Y 4103860.9, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, T.33 N., R.II E., Conejos County, Hydrologic Unit 13010002, on right bank at highway bridge, 5.7 mi north of Colorado-New Mexico State line, 8 mi downstream from Culebra Creek, 11 mi east of Lobatos, and 14 mi east of Antonito.

Drainage and Period of Record.-- 7,700 mi², approximately, includes 2,940 mi², in closed basin in northern part of San Luis Valley, Colo. June 28, 1899-Nov. 7, 1910, non-recording gage; Nov. 8, 1910, water stage recorder, at present site and datum.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron model Satlink 2 DCP), a float-operated Sutron SDR, and a water temperature sensor in a four foot square timber shelter and cobblestone well. The SDR float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. Unreadable auxiliary outside slope gage.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable, except for Nov. 16-30, Dec. 1-31, 2009, Jan. 1 – Feb. 26, 28, Mar. 1-13, 2010, when the stage-discharge relation was affected by ice; and, Feb. 27, 2010 when six hours of data were missing. Two instrumentation corrections were made to the shaft encoder during the year. A +0.01 ft. correction was made on Mar. 15, 2010. This correction was prorated by time from previous visit. A +0.05 ft. correction was made on Aug. 2, 2010. This correction was due to the oil cylinder leaking oil and was prorated by time with comparison to chart record.

Datum Corrections.-- Levels were run to the Reference Point (RP) inside the gage on Jul. 1, 2010 using B.M. No. 2 as base. The gage was within allowable limits, so a correction was not made. Two-peg tests were performed on the Lietz level (SN 130869) on July 13 and August 26, 2010, and no adjustments were needed or made.

Rating.-- The control is composed of boulders and cobbles. Shifting is caused by movement of sand, silt, and gravel in the streambed, and by seasonal heavy weed and moss growth. Rating No. 3, in use since May 1, 1965, was used again this year. This rating is probably not very well defined due to the constant growth and death cycles of weeds and moss as well as heavy silt deposition due to this growth. There is only a brief period of time after ice goes out and scours the channel and before heavy aquatic growth begins that the true stage-discharge relation is not influenced by other factors. Twenty-six measurements (145-170) were made this year ranging in discharge from 28.6 to 1340 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 15, Sep. 18-21, 24, 2010; and the higher daily flows on May 30, 31, 2010. The peak flow of 1640 cfs occurred at 1130 on May 31, 2010 at a gage height of 3.48 feet with a shift of -0.22 feet. It exceeded high measurement No. 162 with a gage height of 3.21 ft, made June 1, 2010 by 0.27 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. A variable shift curve (RIOLOBVS1001) was used to define the stage-shift relation for the period of May 20 to June 1, 2010. The shift curve was left open-ended at the top since there was no evidence to indicate shifts trending back toward the rating. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time. Measurements show shifts varied from -0.33 to +0.05 feet. All measurements were given full weight and applied except Nos. 159, 160, and 170 which were adjusted as much as 4% to smooth shift distribution. Measurement No. 145, the first measurement of WY2010 was not used due to very poor measurement conditions (high winds causing white caps moving upstream).

Special Computations.-- Discharge for periods of ice-affected record was estimated using eight measurements, weather records, trends, and comparison with the stations Rio Grande near Cerro, New Mexico, and Rio Grande near Taos Junction Bridge, New Mexico minus the Red River near Questa, New Mexico. A hydrograph was used.

Remarks.-- Due to the high frequency of measurements, the record is considered good except for periods of no gage-height and ice-affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08251500 RIO GRANDE RIVER NEAR LOBATOS

RATING TABLE--

RIOLOBCO03 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	140	155	240	270	315	728	835	1290	149	45	30
2	32	165	140	245	260	320	826	664	1000	134	48	30
3	36	197	90	240	265	325	852	603	851	135	52	42
4	44	176	125	235	275	335	766	541	791	127	56	40
5	44	155	150	240	275	335	694	476	838	152	54	36
6	37	147	170	240	275	345	609	453	868	139	44	32
7	40	135	195	235	285	380	498	534	956	103	39	30
8	47	143	175	235	290	400	446	635	1020	82	36	35
9	55	151	155	235	290	395	403	606	913	75	67	39
10	55	167	215	230	285	425	411	633	844	66	52	34
11	72	172	205	225	280	425	522	787	801	83	34	32
12	73	160	215	225	275	450	648	743	634	93	30	43
13	70	158	210	230	285	470	776	637	565	91	30	44
14	78	157	215	235	285	453	1100	558	522	87	30	38
15	86	151	230	235	280	430	826	499	532	92	28	32
16	86	120	245	235	285	443	690	482	491	92	34	29
17	85	120	255	240	285	464	758	473	462	75	39	33
18	81	125	255	245	285	503	849	515	385	69	38	26
19	82	115	255	245	290	526	1110	566	310	49	39	24
20	85	115	265	250	295	520	1070	529	271	44	37	23
21	88	120	265	255	295	486	969	459	281	44	43	22
22	103	120	275	260	295	495	1110	450	266	54	40	29
23	110	115	280	255	260	492	1340	516	243	44	43	36
24	142	80	260	250	300	512	1300	802	210	45	42	26
25	176	80	260	245	310	567	901	952	179	55	37	33
26	165	95	255	240	310	576	776	842	165	59	37	46
27	157	110	240	245	300	602	791	686	173	55	40	57
28	150	145	245	260	305	626	825	670	222	41	40	41
29	140	115	245	260	---	628	877	1030	218	39	37	36
30	141	135	250	265	---	634	977	1370	182	39	35	41
31	142	---	250	265	---	654	---	1560	---	43	30	---
TOTAL	2736	4084	6745	7540	7990	14531	24448	21106	16483	2455	1256	1039
MEAN	88.3	136	218	243	285	469	815	681	549	79.2	40.5	34.6
AC-FT	5430	8100	13380	14960	15850	28820	48490	41860	32690	4870	2490	2060
MAX	176	197	280	265	310	654	1340	1560	1290	152	67	57
MIN	32	80	90	225	260	315	403	450	165	39	28	22

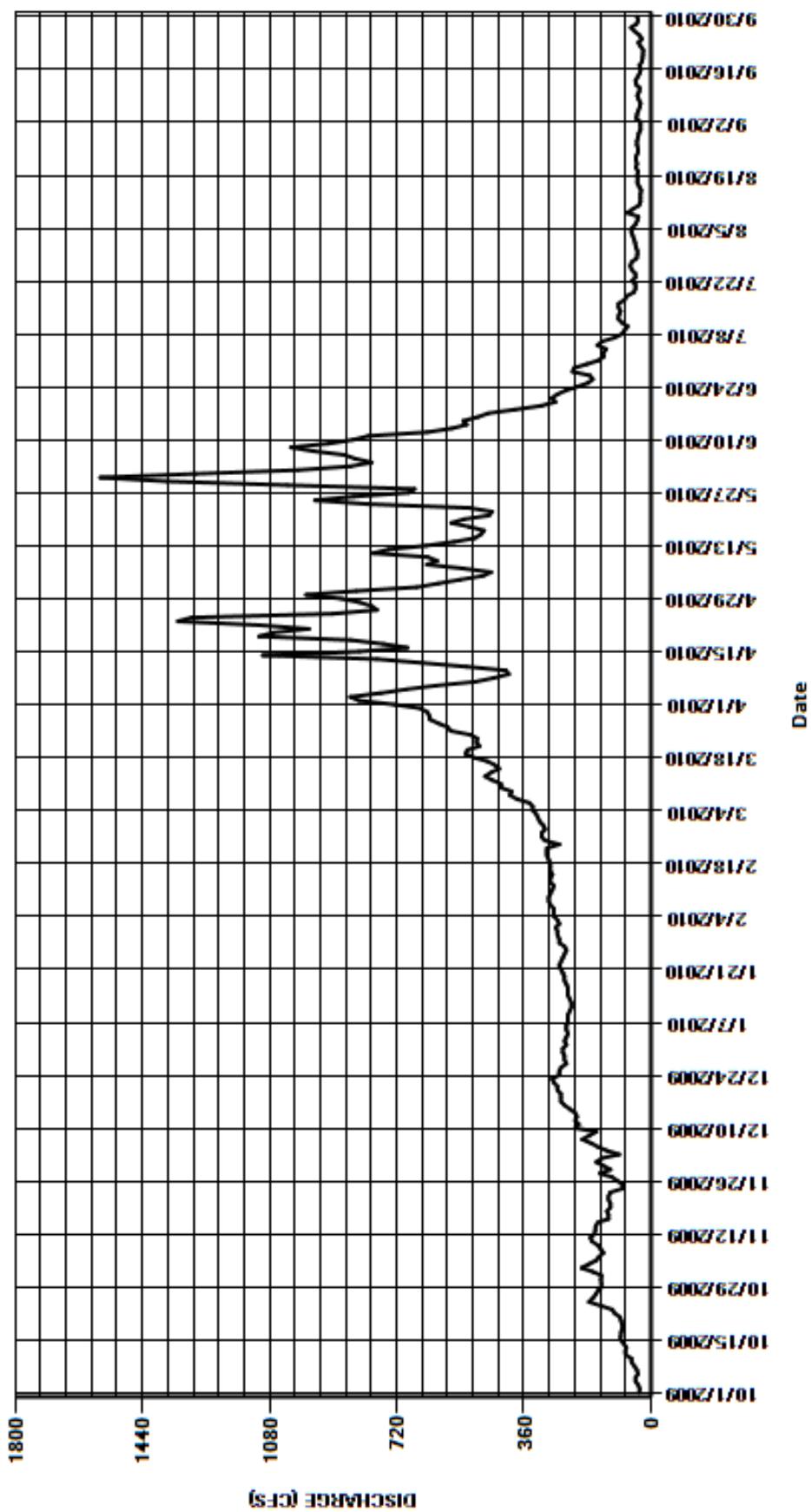
CAL YR	2009	TOTAL	145864	MEAN	400	MAX	2420	MIN	32	AC-FT	289300
WTR YR	2010	TOTAL	110413	MEAN	303	MAX	1560	MIN	22	AC-FT	219000

MAX DISCH: 1640 CFS AT 11:30 ON May. 31,2010 GH 3.48 FT. SHIFT -0.22 FT.

MAX GH: 3.48 FT. AT 11:30 ON May. 31,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08251500 RIO GRANDE RIVER NEAR LOBATOS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09118200 TARBELL DITCH NEAR COCHETOPA PASS
Water Year 2010

Location.-- UTM X 342475.3, Y 4206500.5; Tarbell ditch diverts water from Lake Fork Cochetopa Creek (tributary to Cochetopa Creek), in NW $\frac{1}{4}$ sec. 18, T.43 N., R.2 E., in Gunnison River basin, to Lake Fork Creek (tributary to Middle Fork Saguache Creek) in NE $\frac{1}{4}$ sec. 18, T.43 N., R.2 E., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Data collection platform (Sutron Model Satlink2 Logger with HDR GOES radio) and a float-operated shaft encoder in a lumber shelter and steel culvert pipe stilling well. A Stevens F-type chart recorder is also occasionally used. One intake pipe attaches well to 2.5 foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete from May 27, 2010 when diversion started to Sep. 9, 2010 when diversion stopped. There is some uncertainty during the period of May 27 to Jun. 4, 2010, before satellite system was started and recorder chart was primary record, due to large pen corrections and possible pen slippage. There was no flow from Oct. 1, 2009 to May 26, 2010 and from Sep. 10, 2010 to Sep. 30, 2010.

Datum Corrections.-- The flume is in fair condition. The measured depths on measurement #39, made Jun. 6, 2010, indicate that flume floor is fairly level laterally. However, it has been noted that both flume walls are leaning from left to right. There is also a large flat rock placed at left side of flume entrance to prevent erosion, which affects velocities at left edge of flume.

Rating.-- Rating TARBELCO01, a standard 2.5 foot Parshall flume rating, was used all year. Sediment and rock above flume cause minor shifting. One discharge measurement (No. 39) was made this year, with a discharge of 7.17 cfs. The peak flow of 14.9 cfs occurred at 2030 on May 28, 2010 at a gage height of 1.34 ft (gage height correction of -0.14 ft. applied) with a shift of -0.05 ft. The peak exceeded measurement No. 39, made Jun. 4, 2010, by 0.48 ft in stage.

Discharge.-- The measured shift (-0.05 feet) was distributed through the entire period of record. Discharge measurements (Nos. 34 to 39) indicate that the shift of -0.05 feet would be accurate through the range in stage encountered.

Special Computations.--

Remarks.-- Record is fair except for the period of May 27 to June 4, 2010, which is poor due to questionable gage height data. This period includes the peak flow for the year which should also be considered poor. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09118200 TARBELL DITCH NEAR COCHETOPA PASS

RATING TABLE-- TARBELCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

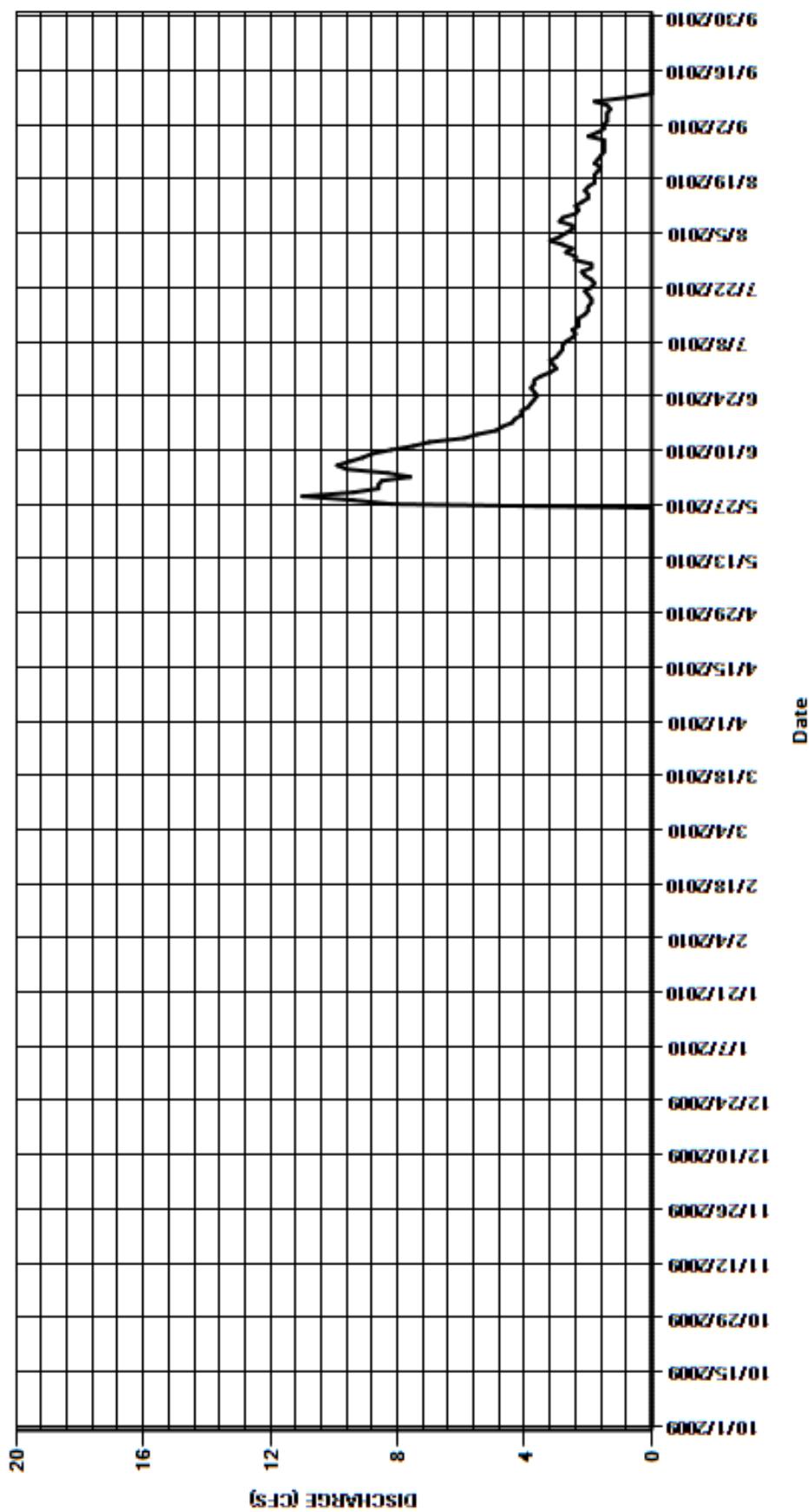
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	8.6	3	2.5	1.5
2	0	0	0	0	0	0	0	0	8.5	3.1	2.8	1.5
3	0	0	0	0	0	0	0	0	7.6	3.2	3.2	1.4
4	0	0	0	0	0	0	0	0	8.3	3	2.9	1.4
5	0	0	0	0	0	0	0	0	9.6	2.9	2.7	1.4
6	0	0	0	0	0	0	0	0	9.9	2.8	2.5	1.3
7	0	0	0	0	0	0	0	0	9.5	2.8	2.5	1.4
8	0	0	0	0	0	0	0	0	9.1	2.7	2.9	1.8
9	0	0	0	0	0	0	0	0	8.8	2.5	2.8	0.79
10	0	0	0	0	0	0	0	0	8.2	2.4	2.4	0
11	0	0	0	0	0	0	0	0	7.5	2.5	2.3	0
12	0	0	0	0	0	0	0	0	7	2.3	2.4	0
13	0	0	0	0	0	0	0	0	5.9	2.3	2.2	0
14	0	0	0	0	0	0	0	0	5.5	2.3	2	0
15	0	0	0	0	0	0	0	0	4.9	2.1	2	0
16	0	0	0	0	0	0	0	0	4.7	2	2.1	0
17	0	0	0	0	0	0	0	0	4.4	2	2	0
18	0	0	0	0	0	0	0	0	4.3	1.9	1.8	0
19	0	0	0	0	0	0	0	0	4.1	1.9	1.8	0
20	0	0	0	0	0	0	0	0	4.1	2	1.8	0
21	0	0	0	0	0	0	0	0	3.9	2.1	1.7	0
22	0	0	0	0	0	0	0	0	3.8	1.9	1.6	0
23	0	0	0	0	0	0	0	0	3.7	1.8	1.8	0
24	0	0	0	0	0	0	0	0	3.6	1.9	1.7	0
25	0	0	0	0	0	0	0	0	3.7	2.1	1.6	0
26	0	0	0	0	0	0	0	0	3.8	2.2	1.5	0
27	0	0	0	0	0	0	0	0	8.2	3.7	1.9	1.5
28	0	0	0	0	0	0	0	0	9.4	3.7	1.9	1.5
29	0	0	0	0	---	0	0	0	11	3.5	2.4	1.5
30	0	0	0	0	---	0	0	0	9.4	3.2	2.4	2
31	0	---	0	0	---	0	0	---	8.6	---	2.7	1.7
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.60	177.1	73.0	65.7	12.49
MEAN	0	0	0	0	0	0	0	1.5	5.9	2.35	2.12	0.42
AC-FT	0	0	0	0	0	0	0	92	351	145	130	25
MAX	0	0	0	0	0	0	0	11	9.9	3.2	3.2	1.8
MIN	0	0	0	0	0	0	0	0	3.2	1.8	1.5	0

CAL YR	2009	TOTAL	257.81	MEAN	0.71	MAX	5.4	MIN	0	AC-FT	511
WTR YR	2010	TOTAL	374.89	MEAN	1.03	MAX	11	MIN	0	AC-FT	744

MAX DISCH: 14.9 CFS AT 20:30 ON May. 28,2010 GH 1.34 FT. SHIFT -0.05 FT. (GH CORR -0.14 FT. APPLIED)
MAX GH: 1.34 FT. AT 20:30 ON May. 28,2010 (GH CORR -0.14 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09118200 TARBELL DITCH NEAR COCHETOPA PASS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09121000 TABOR DITCH AT SPRING CREEK PASS, CO
Water Year 2010

Location.-- Lat. 37°56'22.17", Long. 107°09'30.52", UTM X 310330.0, Y 4201312.0; Tabor ditch diverts water from tributaries of Cebolla Creek in secs. 29 and 36, T.43 N., R.3 W., in Gunnison River basin, to Big Spring Creek (tributary to North Clear Creek) in sec. 35, T.43 N., R.3 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Primary record is generated by an electronic data logger with satellite transmitter, which records gage-height data from a float-operated shaft encoder in a steel shelter and stilling well. One intake pipe attaches well to 3 foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Period of record for WY2010 is Oct. 1 to Oct. 25, 2009 when diversion stopped, and May 6, 2010 when diversion started to Sep. 30, 2010. Record is complete and reliable, except for Oct. 1-3, 5-7, 9-12, 16-18, 21-25, 2009, and May 17, 2010, when the stage-discharge relation was affected by ice; May 6-16, 2010, when float was affected by ice in well; and July 24-28, 2010, due to missing data. The shaft encoder gage-height was 0.02 foot too low on Jun. 4, 2010, so a +0.02 foot shaft encoder correction (SEC) was prorated by time from previous visit on May 14, 2010, and on June 18, 2010 the gage height was 0.02 foot too high, so a -0.02 foot shaft encoder correction (SEC) was prorated from the previous visit on June 4, 2010. There was no flow from Oct. 26, 2009 to May 5, 2010.

Datum Corrections.-- The flume is in fair condition. Levels run at the flume on July 31, 2008 indicate that the flume throat is approximately 0.07' below the reference point at the staff gage likely due to settlement.

Rating.-- Rating TABDITCO01 was used all year. Settlement of the flume throat section and siltation of the gage pool which has increased approach velocities are the likely causes of minor positive shifting. Eight measurements (Nos. 152-159) were made this year, No. 159 was not used due to very poor conditions. They range in discharge from 0.35 to 3.4 cfs. Measurements cover the range experienced except for the lower daily flows on Oct. 18-20, 25, 2009; and the higher daily flows on May 17-31, June 1, 2, 4, 5, 2010. The peak flow of 19.4 cfs occurred at 1800 on May 28, 2010 at a gage height of 1.26 ft. (gage height corr. of +0.01 ft. applied), with a shift of +0.10 ft. It exceeded high measurement No. 154 (GH=0.36 ft.) made June 4, 2010 by 0.90 ft. in stage.

Discharge.-- Shifting control method was used during all record periods. Shifts were applied as defined by discharge measurements and distributed by time. This year's measurements show shifts varied between +0.03 and +0.11 ft. All were given full weight, except No. 158 which was adjusted 5% to smooth shift distribution. Msmt No. 159 was not used due to very poor conditions.

Special Computations.-- Flows during periods of ice effect were estimated using temperature records, partial day good record and good record before and after ice effect.

Remarks.-- Record is good to fair at lower flows, except for periods of no gage-height and ice affected record, which are poor. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09121000 TABOR DITCH AT SPRING CREEK PASS, CO

RATING TABLE--

TABDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

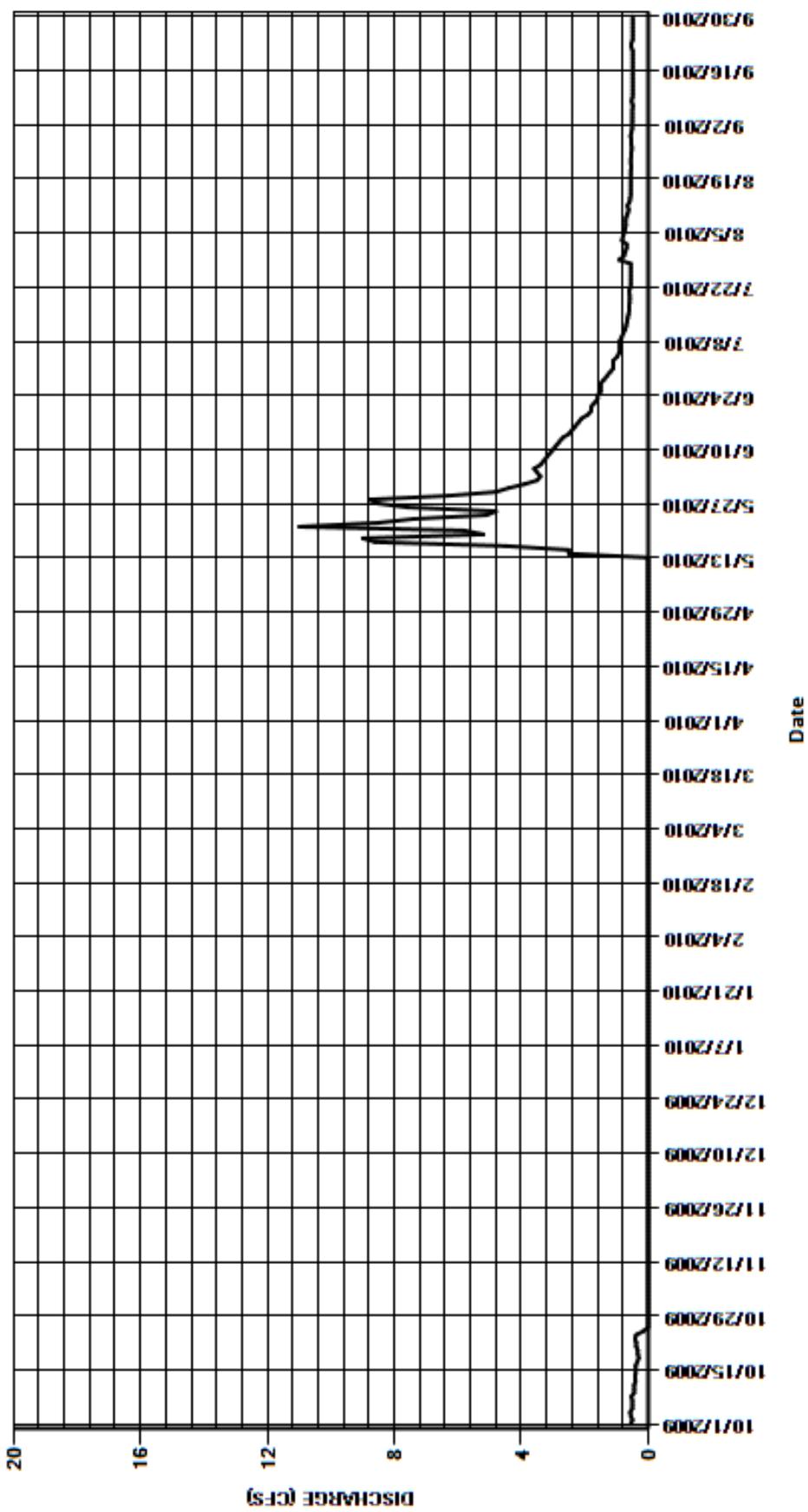
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.55	0	0	0	0	0	0	0	3.9	1.1	0.69	0.51
2	0.5	0	0	0	0	0	0	0	3.5	1.1	0.68	0.51
3	0.55	0	0	0	0	0	0	0	3.4	1.1	0.83	0.5
4	0.57	0	0	0	0	0	0	0	3.5	0.98	0.8	0.5
5	0.5	0	0	0	0	0	0	0	3.6	0.92	0.76	0.5
6	0.5	0	0	0	0	0	0	0	3.4	0.9	0.73	0.5
7	0.5	0	0	0	0	0	0	0	3.3	0.9	0.71	0.49
8	0.54	0	0	0	0	0	0	0	3.2	0.9	0.72	0.53
9	0.45	0	0	0	0	0	0	0	3.1	0.84	0.7	0.5
10	0.45	0	0	0	0	0	0	0	3	0.79	0.65	0.49
11	0.45	0	0	0	0	0	0	0	2.9	0.73	0.62	0.49
12	0.4	0	0	0	0	0	0	0	2.8	0.7	0.66	0.49
13	0.42	0	0	0	0	0	0	0	2.7	0.67	0.59	0.49
14	0.4	0	0	0	0	0	0	2.5	2.5	0.65	0.57	0.49
15	0.4	0	0	0	0	0	0	2.5	2.4	0.62	0.55	0.49
16	0.4	0	0	0	0	0	0	4.5	2.3	0.6	0.55	0.49
17	0.35	0	0	0	0	0	0	8.6	2.2	0.6	0.55	0.49
18	0.3	0	0	0	0	0	0	9	2.1	0.59	0.55	0.49
19	0.33	0	0	0	0	0	0	5.2	1.9	0.58	0.55	0.49
20	0.33	0	0	0	0	0	0	5.8	1.8	0.59	0.55	0.49
21	0.38	0	0	0	0	0	0	0	11	1.8	0.6	0.55
22	0.38	0	0	0	0	0	0	8.5	1.7	0.56	0.54	0.53
23	0.42	0	0	0	0	0	0	7.4	1.6	0.55	0.55	0.53
24	0.38	0	0	0	0	0	0	5.1	1.6	0.55	0.55	0.49
25	0.15	0	0	0	0	0	0	4.8	1.5	0.55	0.54	0.49
26	0	0	0	0	0	0	0	7.6	1.5	0.55	0.53	0.49
27	0	0	0	0	0	0	0	8.5	1.5	0.55	0.52	0.49
28	0	0	0	0	0	0	0	8.8	1.4	0.55	0.54	0.49
29	0	0	0	0	---	0	0	6.3	1.3	0.92	0.53	0.49
30	0	0	0	0	---	0	0	4.8	1.2	0.77	0.56	0.49
31	0	---	0	0	---	0	---	4.4	---	0.73	0.53	---
TOTAL	10.60	0.00	0.00	0.00	0.00	0.00	0.00	115.30	72.6	22.74	18.95	14.91
MEAN	0.34	0	0	0	0	0	0	3.72	2.42	0.73	0.61	0.5
AC-FT	21	0	0	0	0	0	0	229	144	45	38	30
MAX	0.57	0	0	0	0	0	0	11	3.9	1.1	0.83	0.53
MIN	0	0	0	0	0	0	0	0	1.2	0.55	0.52	0.49

CAL YR	2009	TOTAL	416.70	MEAN	1.14	MAX	14	MIN	0	AC-FT	827
WTR YR	2010	TOTAL	255.10	MEAN	0.7	MAX	11	MIN	0	AC-FT	506

MAX DISCH: 19.4 CFS AT 18:00 ON May. 28,2010 GH 1.26 FT. SHIFT 0.1 FT. (GH CORR. +0.01 FT. APPLIED)
 MAX GH: 1.26 FT. AT 18:00 ON May. 28,2010 (GH CORR +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09121000 TABORD DITCH AT SPRING CREEK PASS, CO
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
Water Year 2010

Location.-- Treasure Pass diversion ditch diverts water from tributaries of Wolf Creek in San Juan River basin, to tributary of South Fork Rio Grande in sec. 5, T.37 N., R.2 E., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Float-operated Stevens F-type chart recorder in a CMP shelter and stilling well. One intake pipe attaches well to 2 foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Record is complete and reliable from May 28, 2010 when diversion started to Jul. 4, 2010 when flow ceased, except for May 30, 31 June 1, 2, 30, and July 1 when the gage was isolated and June 15 when the chart ran out. There was also no flow from Oct. 1, 2009 to May 27, 2010 and from Jul. 5 to Sep. 30, 2010.

Datum Corrections.-- The flume is in poor condition. It is not level and the cross-bars in the converging and diverging sections are bent indicating that flume walls are leaning inward. There is not much of a stilling pool above flume so approach velocity is high. Flume replaced September 1, 2010.

Rating.-- Rating TREDITCO01, a standard 2 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause shifting. The peak flow of 8.88 cfs occurred at 1730 on June 6, 2010 at a gage height of 1.09 ft.(gage height correction of +0.02 ft applied) with a shift of -0.02 ft. The peak exceeded measurement No. 28 made June 7, 2010 (GH 1.01 ft.) by 0.08 ft in stage.

Discharge.-- The flume and gage house were worked on June 6, 2010. The flume was leveled and the stilling well was straightened. This caused a shift from 0.07 ft. to the -0.02 ft. which was measured on June 7, 2010. The -0.02 ft. shift was ran the rest of the period.

Special Computations.-- June 15, 2010 was estimated from available gage height data since pen ran off chart.

Remarks.-- Record is good except for the periods of May 28 and July 2, 3, 4, 2010, which were rated fair due to uncertainty in shift at low stages. Station maintained by Div 3 hydrographic staff and record developed by Jesse Jaminet.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS

RATING TABLE--

TREDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0.47	0	0
3	0	0	0	0	0	0	0	0	4.7	0.42	0	0
4	0	0	0	0	0	0	0	0	5.9	0.08	0	0
5	0	0	0	0	0	0	0	0	7.8	0	0	0
6	0	0	0	0	0	0	0	0	8.5	0	0	0
7	0	0	0	0	0	0	0	0	8.4	0	0	0
8	0	0	0	0	0	0	0	0	8	0	0	0
9	0	0	0	0	0	0	0	0	7.3	0	0	0
10	0	0	0	0	0	0	0	0	6.6	0	0	0
11	0	0	0	0	0	0	0	0	5.5	0	0	0
12	0	0	0	0	0	0	0	0	4.5	0	0	0
13	0	0	0	0	0	0	0	0	3.4	0	0	0
14	0	0	0	0	0	0	0	0	2.6	0	0	0
15	0	0	0	0	0	0	0	0	2.1	0	0	0
16	0	0	0	0	0	0	0	0	1.9	0	0	0
17	0	0	0	0	0	0	0	0	1.9	0	0	0
18	0	0	0	0	0	0	0	0	1.7	0	0	0
19	0	0	0	0	0	0	0	0	1.6	0	0	0
20	0	0	0	0	0	0	0	0	1.4	0	0	0
21	0	0	0	0	0	0	0	0	1.2	0	0	0
22	0	0	0	0	0	0	0	0	1.1	0	0	0
23	0	0	0	0	0	0	0	0	0.99	0	0	0
24	0	0	0	0	0	0	0	0	0.88	0	0	0
25	0	0	0	0	0	0	0	0	0.71	0	0	0
26	0	0	0	0	0	0	0	0	0.61	0	0	0
27	0	0	0	0	0	0	0	0	0.47	0	0	0
28	0	0	0	0	0	0	0	0	0.42	0	0	0
29	0	0	0	0	---	0	0	0.51	0.1	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	90.28	0.97	0.00	0.00
MEAN	0	0	0	0	0	0	0	0.026	3.01	0.031	0	0
AC-FT	0	0	0	0	0	0	0	1.6	179	1.9	0	0
MAX	0	0	0	0	0	0	0	0.51	8.5	0.47	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

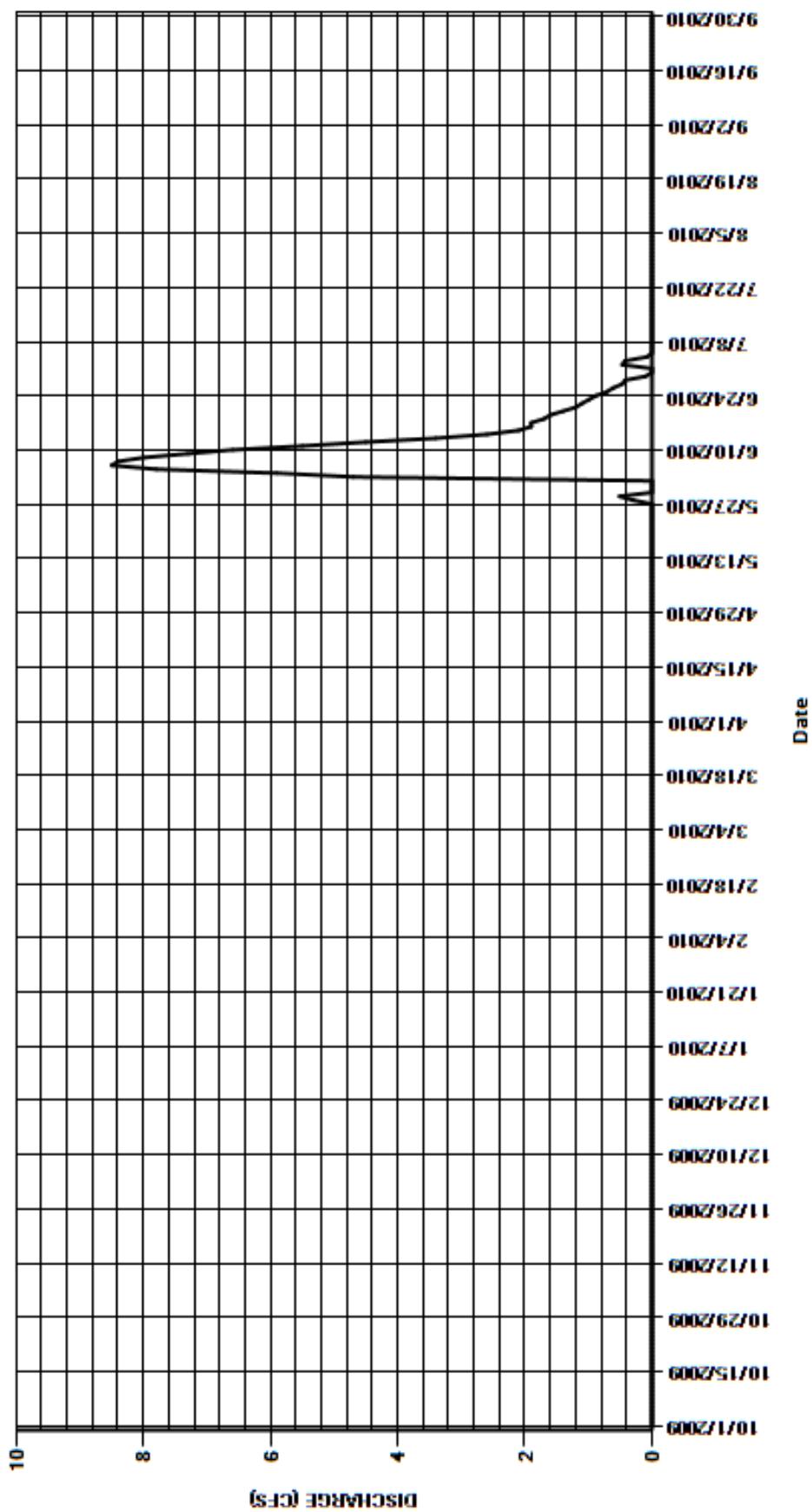
CAL YR	2009	TOTAL	132.03	MEAN	0.36	MAX	5.7	MIN	0	AC-FT	262
WTR YR	2010	TOTAL	92.06	MEAN	0.25	MAX	8.5	MIN	0	AC-FT	183

MAX DISCH: 8.88 CFS AT 17:30 ON Jun. 06,2010 GH 1.09 FT. SHIFT -0.02 FT. (GH CORR +0.02 FT. APPLIED)

MAX GH: 1.09 FT. AT 17:30 ON Jun. 06,2010 (GH CORR +0.02 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
DON LA FONT DITCH NO. 1 AT PIEDRA PASS
Water Year 2010

Location.-- SW $\frac{1}{4}$ sec. 33, T.39 N., R.1 W., at Piedra Pass, Co. Diversion is from tributaries of Piedra River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Float-operated Sutron SDR data logger in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 9 inch Parshall flume. The only reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Wildlife (DOW).

Hydrologic Conditions.--

Gage-Height Record.-- No record.

Datum Corrections.--

Rating.-- Rating DLFDT1CO02, a standard 9 inch Parshall flume rating. There were no discharge measurements made this year. The last measurement was made on Jul. 7, 2005 and resulted in a shift of -0.03 feet.

Discharge.-- There was no flow during this water year.

Special Computations.--

Remarks.-- Record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH NO. 1 AT PIEDRA PASS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

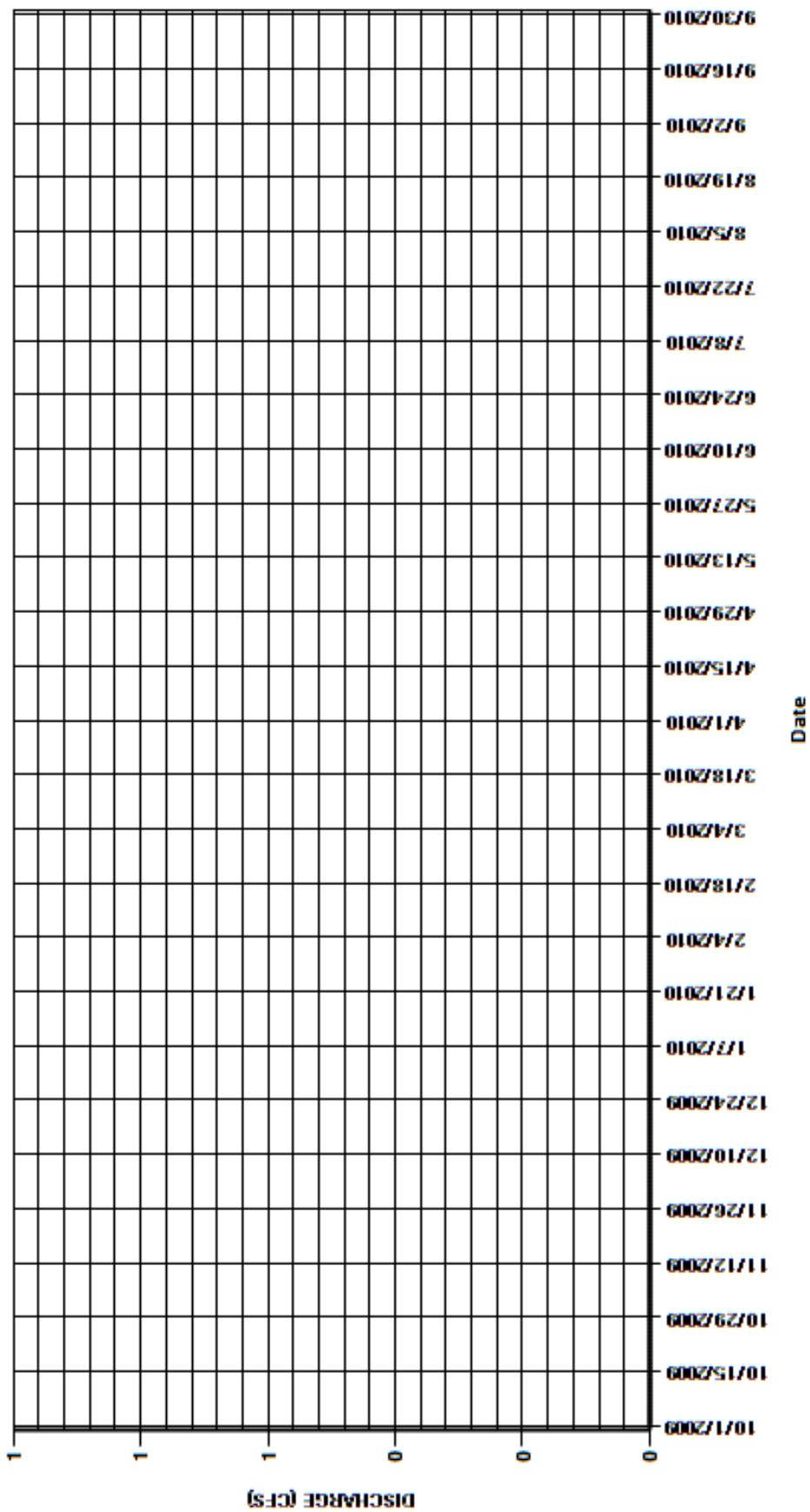
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0	0	0	0	0	0	0	0	0	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	16.96	MEAN	0.046	MAX	1.3	MIN	0	AC-FT	34
WTR YR	2010	TOTAL	0.00	MEAN	0	MAX	0	MIN	0	AC-FT	0

MAX DISCH: 0 CFS
MAX GH: 0 FT.

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DON LA FONT DITCH NO. 1 AT PIEDRA PASS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS
Water Year 2010

Location.-- UTM X 323469, Y 4159709, at Piedra Pass, Co. Diversion is from tributaries of Piedra River in San Juan River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage and Period of Record.-- N/A

Equipment.-- Data collection platform (Sutron Model 8200 DCP with GOES radio) and a float-operated Sutron SDR in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 1.5 foot Parshall flume. The only reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Wildlife (DOW).

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP/SDR logs as backup. Record is complete and reliable from Jun. 23, 2010 when diversion started to Jul. 6, 2010 when satellite system battery died, and complete from Jul. 15, 2010 when battery replaced to Jul. 28, 2010 when system failed again. During the majority of the period of Jul. 15 - 28, 2010, the gage-height was below the point of well isolation (0.11 ft.). According to DOW personnel, backup data in 8200 and SDR were not retrievable. Flow was not accounted for during the missing data period of Jul. 7 – 14, 2010, and periods when gage was isolated from flume.

Datum Corrections.-- The flume is in good condition, but isolates from well at gage height of 0.11 feet. Flow enters flume via an underground discharge pipe which creates non-ideal flow distribution during higher flows.

Rating.-- Rating DLFDT2CO02, a standard 1.5 foot Parshall flume rating, was used all year. There were no discharge measurements made this year. The last measurement was made on Jul. 7, 2005 and resulted in a shift of +0.02 feet. The peak flow of 1.58 cfs occurred at 2130 on Jul. 2, 2010 at a gage height of 0.40 feet with a shift of +0.02 feet.

Discharge.-- The last measured shift (+0.02 feet) was distributed through the entire period of record.

Special Computations.--

Remarks.-- Record is rated poor since there was no discharge measurement made this water year and past measurements show some shift variability. Station maintained by Div 3 hydrographic staff and record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS

RATING TABLE-- DLFDT2CO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0.71	0	0
2	0	0	0	0	0	0	0	0	0	0.86	0	0
3	0	0	0	0	0	0	0	0	0	0.81	0	0
4	0	0	0	0	0	0	0	0	0	0.66	0	0
5	0	0	0	0	0	0	0	0	0	0.56	0	0
6	0	0	0	0	0	0	0	0	0	0.5	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0.11	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0.05	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0.01	0	0
23	0	0	0	0	0	0	0	0	0.69	0	0	0
24	0	0	0	0	0	0	0	0	1	0	0	0
25	0	0	0	0	0	0	0	0	0.99	0.05	0	0
26	0	0	0	0	0	0	0	0	0.92	0.01	0	0
27	0	0	0	0	0	0	0	0	0.86	0	0	0
28	0	0	0	0	0	0	0	0	0.9	0	0	0
29	0	0	0	0	---	0	0	0	0.83	0	0	0
30	0	0	0	0	---	0	0	0	0.76	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.95	4.33	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0.23	0.14	0	0
AC-FT	0	0	0	0	0	0	0	0	14	8.6	0	0
MAX	0	0	0	0	0	0	0	0	1	0.86	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

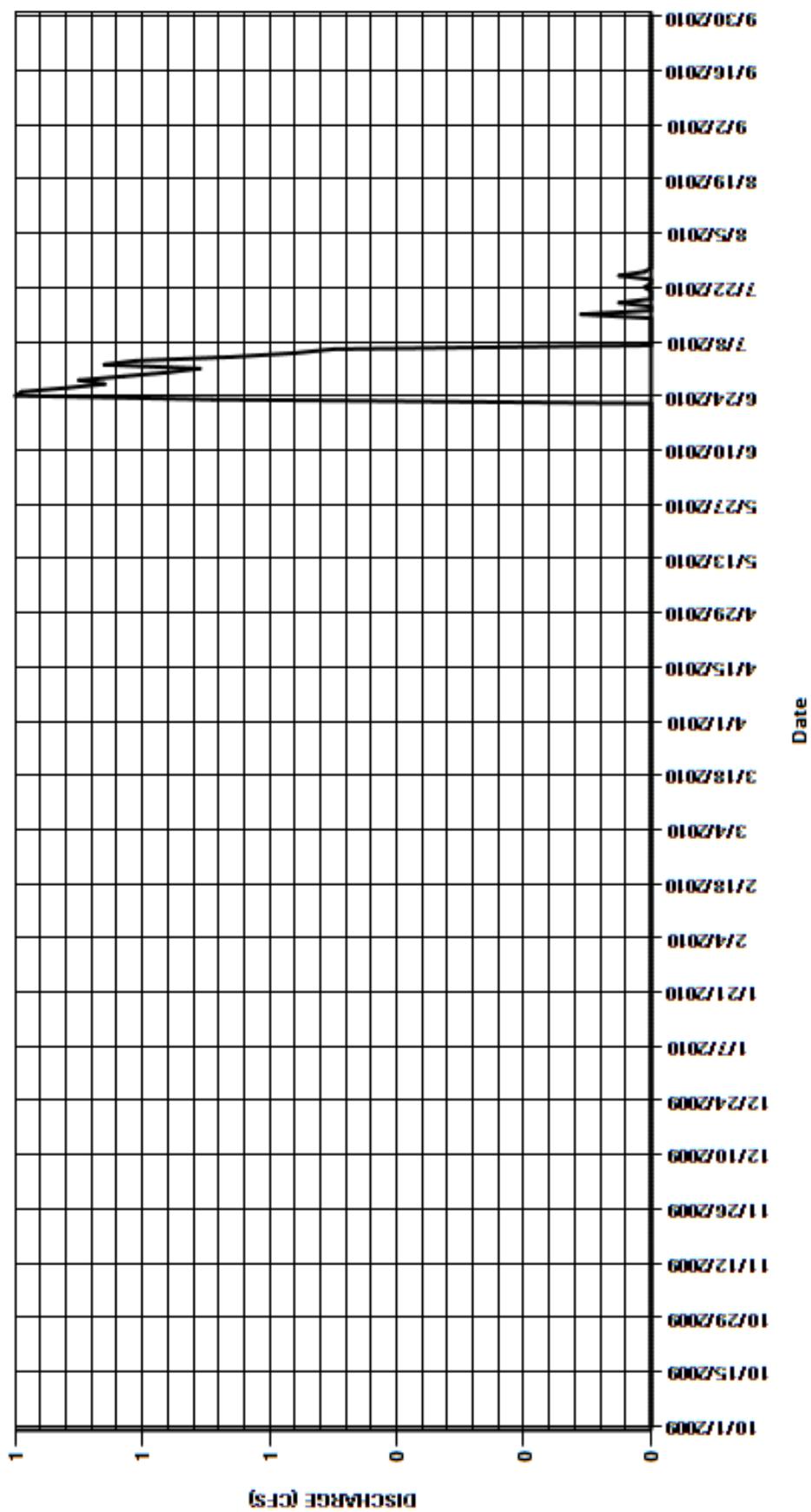
CAL YR	2009	TOTAL	60.60	MEAN	0.17	MAX	3.1	MIN	0	AC-FT	120
WTR YR	2010	TOTAL	11.28	MEAN	0.031	MAX	1	MIN	0	AC-FT	22

MAX DISCH: 1.58 CFS AT 21:30 ON Jul. 02,2010 GH 0.4 FT. SHIFT 0.02 FT.

MAX GH: 0.4 FT. AT 21:30 ON Jul. 02,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09347000 DONLA FONT DITCH NO.2 AT PIEDRA PASS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
DON LA FONT DITCH AT PIEDRA PASS (COMBINED)
Water Year 2010

Location.-- Don La Font ditches 1 and 2 divert water from tributaries of Piedra River between headgates in NW $\frac{1}{4}$ sec. 4, T.38 N., R.1 W., and SW $\frac{1}{4}$ sec. 33, T.39 N., R.1 W., and Piedra pass, in San Juan River basin, to Red Mountain Creek in sec. 33, T.39 N., R.1 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Combined record is from Don La Font Ditches 1 and 2 gages. See individual records for gage equipment descriptions.

Hydrologic Conditions.-- Don La Font Ditches 1 and 2 divert water from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).

Gage-Height Record.-- See individual records for gage height record analyses.

Datum Corrections.-- See individual station analyses.

Rating.-- See individual station analyses.

Discharge.-- Daily discharges computed by summing and rounding the individual station daily discharges.

Special Computations.--

Remarks.-- Record is rated fair since there were no discharge measurements made this water year at the individual ditch gages, and past measurements show considerable shift variability. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH AT PIEDRA PASS (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

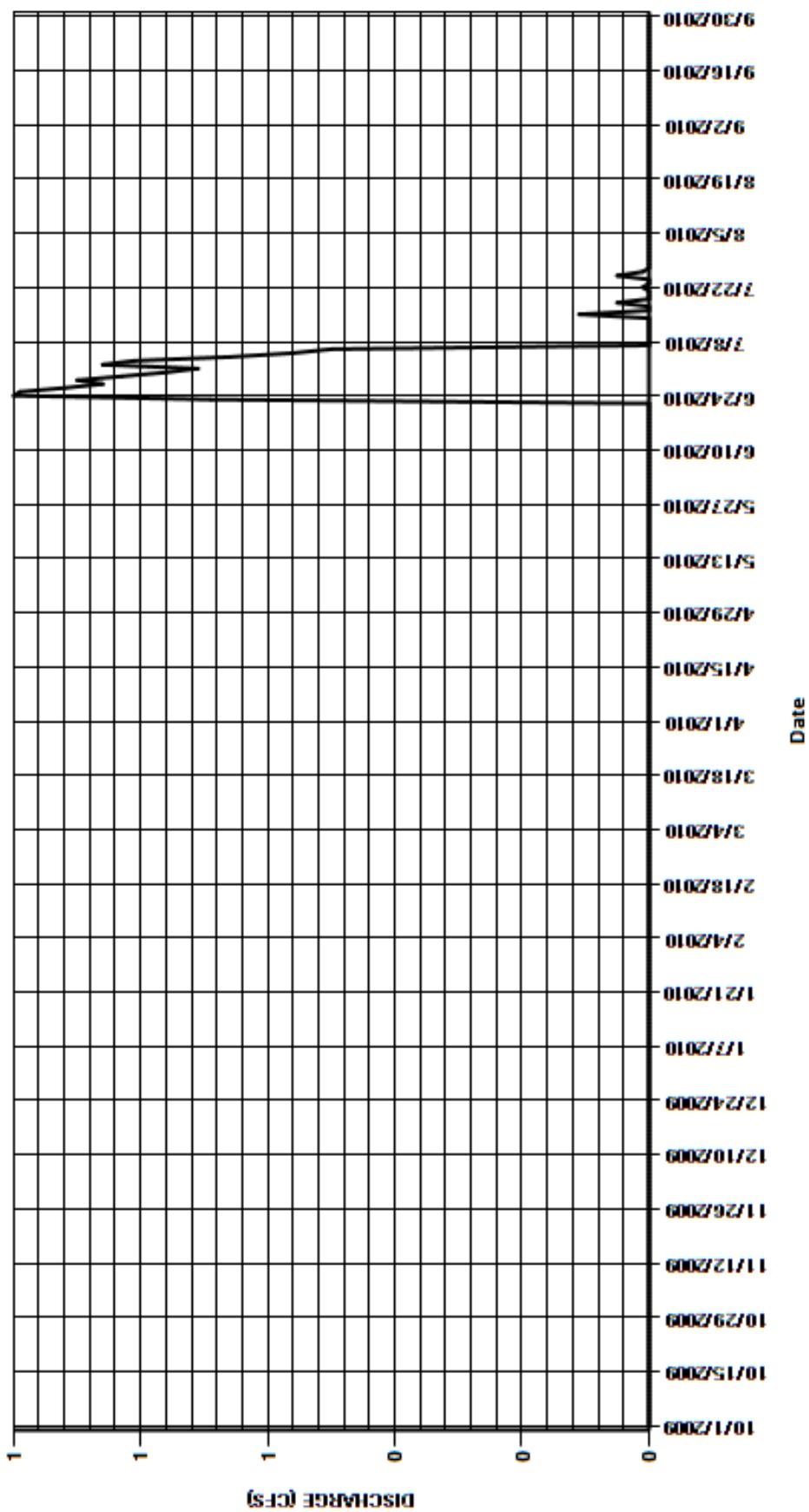
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	0	0.71	0	0
2	0	0	0	0	0	0	0	0	0	0.86	0	0
3	0	0	0	0	0	0	0	0	0	0.81	0	0
4	0	0	0	0	0	0	0	0	0	0.66	0	0
5	0	0	0	0	0	0	0	0	0	0.56	0	0
6	0	0	0	0	0	0	0	0	0	0.5	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0.11	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0.05	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0.01	0	0
23	0	0	0	0	0	0	0	0	0.69	0	0	0
24	0	0	0	0	0	0	0	0	1	0	0	0
25	0	0	0	0	0	0	0	0	0.99	0.05	0	0
26	0	0	0	0	0	0	0	0	0.92	0.01	0	0
27	0	0	0	0	0	0	0	0	0.86	0	0	0
28	0	0	0	0	0	0	0	0	0.9	0	0	0
29	0	0	0	0	---	0	0	0	0.83	0	0	0
30	0	0	0	0	---	0	0	0	0.76	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.95	4.33	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	0.23	0.14	0	0
AC-FT	0	0	0	0	0	0	0	0	14	8.6	0	0
MAX	0	0	0	0	0	0	0	0	1	0.86	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	77.60	MEAN	0.21	MAX	4.2	MIN	0	AC-FT	154
WTR YR	2010	TOTAL	11.28	MEAN	0.031	MAX	1	MIN	0	AC-FT	22

MAX DISCH: N/A -- see record for individual gages
MAX GH: FT. N/A -- see record for individual gages

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DON LAFONT DITCH AT PIEDRAPASS (COMBINED)
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
Water Year 2010

Location.-- UTM X 304233, Y 4163756, William's Creek-Squaw Pass ditch diverts water from William's Creek (tributary to Piedra River) in sec. 21, T.39 N., R.3 W., in San Juan River basin, to Squaw Creek in sec. 21, T.39 N., R.3 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage height data from a float-operated shaft encoder in a wood shelter with metal pipe stilling well. One intake pipe attaches well to 2 foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable from May 25, 2010 when diversion started to Sep. 19, 2010 when diversion stopped. The shaft encoder gage height was set 0.04 feet too high on May 25, 2010, a -0.04 feet shaft encoder correction (SEC) was applied to all gage-heights from May 25 to June 25, 2010 at 08:35. The high flows from May 25, 2010 to June 5, 2010 deposited gravel below the flume causing the flume to be submerged from June 8, 2010 until June 25, 2010 when ditch below gage was cleaned. There was no flow from Oct. 1, 2009 to May 24, 2010 and from Sep. 20 to Sep. 30, 2010.

Datum Corrections.-- The flume is in fair condition.

Rating.-- Rating WCSDITCO02 was used all year. Changes in approach conditions above flume and deposition below flume cause minor shifting. One discharge measurement (No. 31) was made this year, with a discharge of 1.09 cfs. This measurement yielded a shift of -0.26 ft due to flume being submerged; submergence was caused by sedimentation below flume. Ditch below flume was cleaned after the measurement was made. The ditch cleaning resulted in a change in gage height of -0.25 ft with a final gage height of 0.24 ft and a shift of -0.01 ft. The peak flow of 15.9 cfs occurred at 1600 on June 5, 2010 at a gage height of 1.30 ft (gage height corr. -0.04 ft. applied) with a shift of -0.08 ft. The peak exceeded measurement No. 31, made June 25, 2010, by 1.06 ft in stage.

Discharge.-- The measured shift (-0.08 feet) from Measurement No. 30, WY2009, was distributed from May 25, 2010 until June 5, 2010 when it was assumed that the flume started to become more submerged. The -0.08 ft shift was then prorated to a -0.26 ft between June 5, and June 9, 2010 when it is believed that the gravel below the flume was deposited. The -0.26 shift was then ran until the ditch below the flume was cleaned on June 25, 2010. The measured -0.01 shift from Msmt 31 was then run through the remaining period of record.

Special Computations.--

Remarks.-- Record is fair due to uncertainty in shift stability caused by possible varying submergence with gage-height and time. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS

RATING TABLE-- WCSDITCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	4.1	0.67	1.2	0.77
2	0	0	0	0	0	0	0	0	3.3	0.74	1	0.64
3	0	0	0	0	0	0	0	0	3.1	0.7	1.2	0.54
4	0	0	0	0	0	0	0	0	4.5	0.62	1	0.47
5	0	0	0	0	0	0	0	0	8.3	0.54	1.1	0.44
6	0	0	0	0	0	0	0	0	8.2	0.46	0.88	0.42
7	0	0	0	0	0	0	0	0	6.5	0.46	0.85	0.38
8	0	0	0	0	0	0	0	0	5.6	0.44	1.1	1.6
9	0	0	0	0	0	0	0	0	4.6	0.41	0.98	1.4
10	0	0	0	0	0	0	0	0	3.8	0.54	0.84	1.1
11	0	0	0	0	0	0	0	0	3	0.49	0.75	0.95
12	0	0	0	0	0	0	0	0	2.4	0.45	0.72	0.83
13	0	0	0	0	0	0	0	0	1.9	0.43	0.58	0.71
14	0	0	0	0	0	0	0	0	1.5	0.37	0.49	0.62
15	0	0	0	0	0	0	0	0	1.4	0.32	0.44	0.56
16	0	0	0	0	0	0	0	0	1.6	0.26	0.63	0.52
17	0	0	0	0	0	0	0	0	1.8	0.22	0.49	0.46
18	0	0	0	0	0	0	0	0	1.7	0.15	0.42	0.42
19	0	0	0	0	0	0	0	0	1.6	0.2	0.42	0.15
20	0	0	0	0	0	0	0	0	1.5	0.27	0.37	0
21	0	0	0	0	0	0	0	0	1.4	0.35	0.31	0
22	0	0	0	0	0	0	0	0	1.3	0.3	0.32	0
23	0	0	0	0	0	0	0	0	1.2	0.34	0.59	0
24	0	0	0	0	0	0	0	0	1.1	0.28	0.44	0
25	0	0	0	0	0	0	0	0	1.4	1	0.32	0.42
26	0	0	0	0	0	0	0	0	2.1	1.1	0.32	0.42
27	0	0	0	0	0	0	0	0	3	0.99	0.26	0.39
28	0	0	0	0	0	0	0	0	4	0.89	0.43	0.36
29	0	0	0	0	---	0	0	0	5.4	0.8	0.41	0.37
30	0	0	0	0	---	0	0	0	4.5	0.72	0.69	1.2
31	0	---	0	0	---	0	0	---	4.1	---	0.96	0.86
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.50	80.90	13.40	21.14	12.98
MEAN	0	0	0	0	0	0	0	0.79	2.7	0.43	0.68	0.43
AC-FT	0	0	0	0	0	0	0	49	160	27	42	26
MAX	0	0	0	0	0	0	0	5.4	8.3	0.96	1.2	1.6
MIN	0	0	0	0	0	0	0	0	0.72	0.15	0.31	0

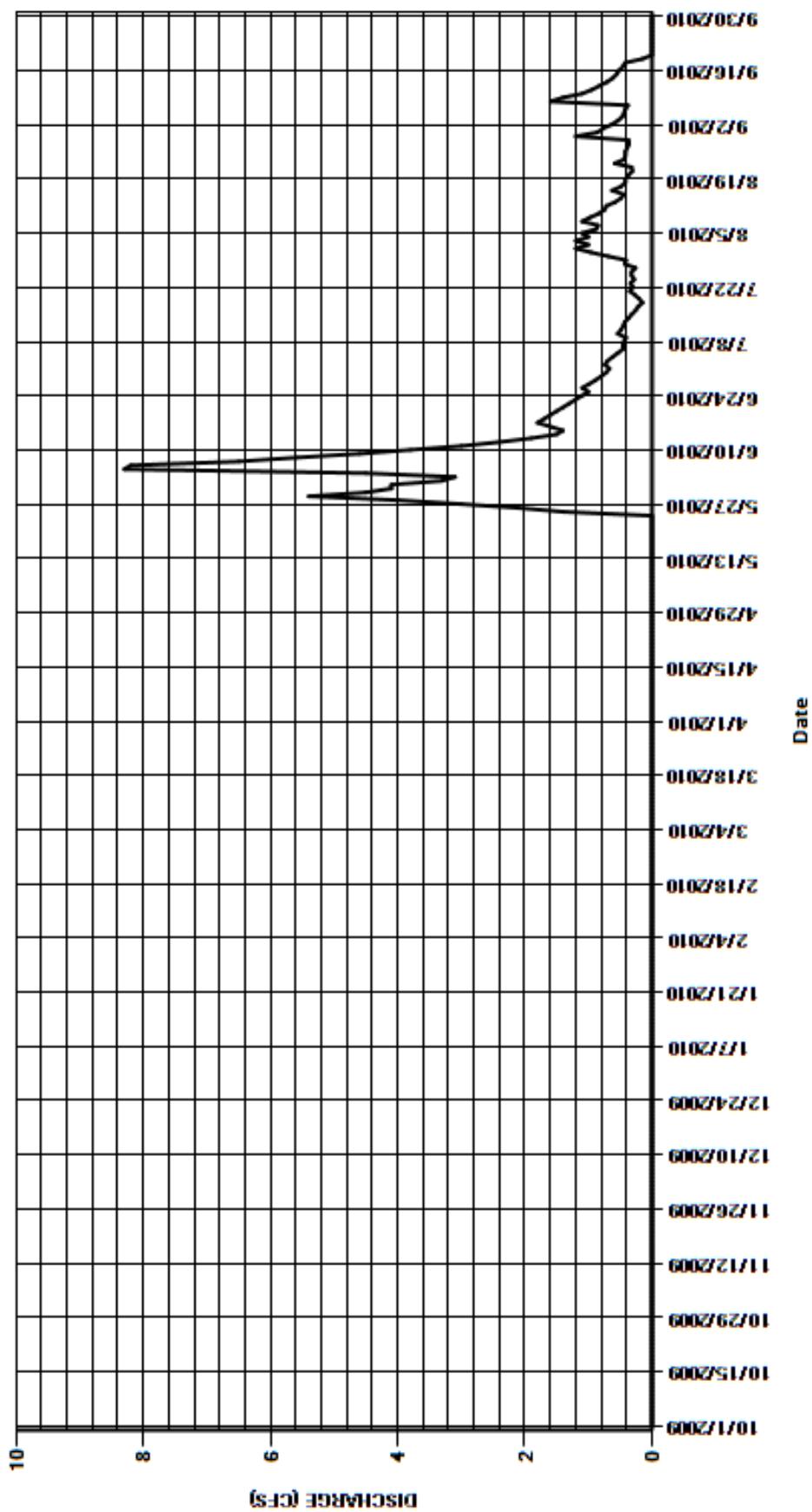
CAL YR	2009	TOTAL	129.45	MEAN	0.35	MAX	3.8	MIN	0	AC-FT	257
WTR YR	2010	TOTAL	152.92	MEAN	0.42	MAX	8.3	MIN	0	AC-FT	303

MAX DISCH: 15.9 CFS AT 16:00 ON Jun. 05,2010 GH 1.3 FT. SHIFT -0.08 FT. (GH CORR. -0.04 FT. APPLIED)

MAX GH: 1.3 FT. AT 16:00 ON Jun. 05,2010 (GH CORR. -0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2010

Location.-- UTM X 295250.0, Y 4171398.3, Pine River-Weminuche Pass ditch diverts water from right bank of north fork of Los Pinos River in sec. 4, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage height data from a float-operated shaft encoder in a wood shelter with stilling well. One intake pipe attaches well to 3 foot Parshall flume. The satellite system was upgraded to a Sutron Satlink2 logger with HDR GOES radio and a Sutron SDR on Aug. 4, 2010.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable May 30 through June 19, and Aug. 7 through Aug. 10, 2010 when diversion was turned off. During 'no-flow' periods, the gage-height did not drop below 0.09 to 0.10 feet. It was assumed that a deposit of silt in the well prevented the shaft encoder float from dropping below that gage-height. There was no flow from Oct. 1, 2009 to May 29, 2010, Jun. 20 through Aug. 6, and Aug. 11 through Sep. 30, 2010. There was a -0.03 ft shaft encoder correction on Jun. 9, 2010, which was applied straight from May 30, 2010 when diversion started.

Datum Corrections.-- The flume is in good condition, but is susceptible to submergence due to sediment deposition in ditch below flume.

Rating.-- Rating PRWDITCO04, a standard 3 foot Parshall flume rating, was used all year. Changes in approach conditions above flume and deposition below flume cause shifting. One discharge measurement, No. 58, made June 9, at a gage height of 0.96 ft and a measured flow of 9.36 cfs, resulted in a shift of -0.11 ft. The peak flow of 11.4 cfs occurred at 2045 on Jun. 1, 2010 at a gage height of 1.08 feet (gage height corr. of -0.03 ft applied) with a shift of -0.11 feet. It exceeded measurement No. 58 by 0.12 ft in stage.

Discharge.-- The measured shift (-0.11 feet) was distributed through the period of record from May 30 until June 19, 2010. The ditch below the flume was cleaned prior to the period of record Aug. 7 through Aug. 10, 2010. A 0.00 ft shift was assumed and applied for these four days of record after cleaning.

Special Computations.--

Remarks.-- Record is fair due to flume submergence before cleaning ditch and the assumed shift after cleaning ditch. Station maintained by Div 3 hydrographic staff and record developed by Stan Ditmars .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE--

PRWDITCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

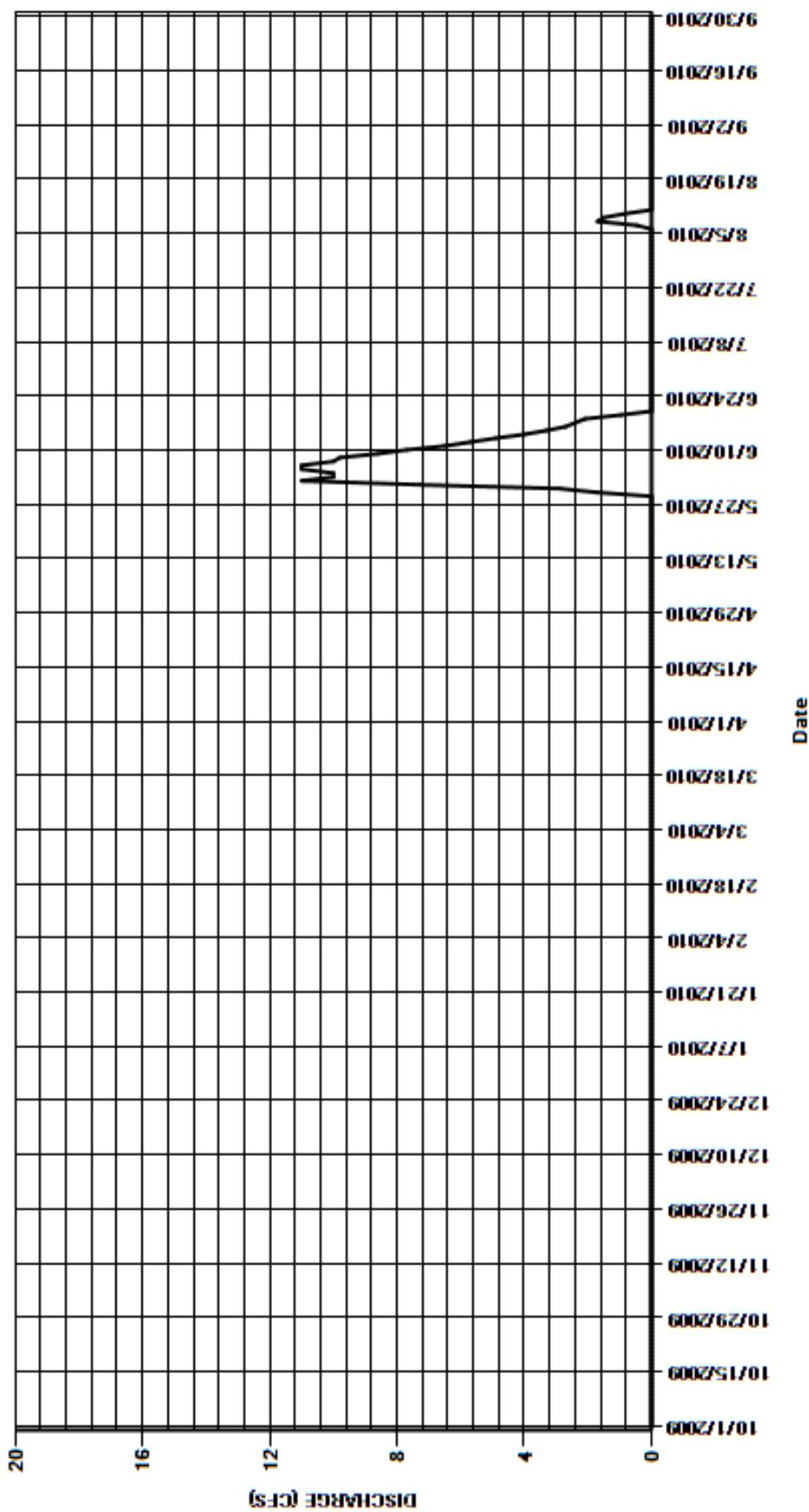
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	7.3	0	0	0
2	0	0	0	0	0	0	0	0	11	0	0	0
3	0	0	0	0	0	0	0	0	10	0	0	0
4	0	0	0	0	0	0	0	0	10	0	0	0
5	0	0	0	0	0	0	0	0	11	0	0	0
6	0	0	0	0	0	0	0	0	11	0	0	0
7	0	0	0	0	0	0	0	0	10	0	0.46	0
8	0	0	0	0	0	0	0	0	9.8	0	1.7	0
9	0	0	0	0	0	0	0	0	8.6	0	1.5	0
10	0	0	0	0	0	0	0	0	7.7	0	0.83	0
11	0	0	0	0	0	0	0	0	6.5	0	0	0
12	0	0	0	0	0	0	0	0	5.7	0	0	0
13	0	0	0	0	0	0	0	0	4.9	0	0	0
14	0	0	0	0	0	0	0	0	4	0	0	0
15	0	0	0	0	0	0	0	0	3.3	0	0	0
16	0	0	0	0	0	0	0	0	2.7	0	0	0
17	0	0	0	0	0	0	0	0	2.4	0	0	0
18	0	0	0	0	0	0	0	0	2.1	0	0	0
19	0	0	0	0	0	0	0	0	0.97	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	1.7	0	0	0	0
31	0	---	0	0	---	0	---	2.9	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.60	128.97	0.00	4.49	0.00
MEAN	0	0	0	0	0	0	0	0.15	4.3	0	0.14	0
AC-FT	0	0	0	0	0	0	0	9.1	256	0	8.9	0
MAX	0	0	0	0	0	0	0	2.9	11	0	1.7	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	165.76	MEAN	0.45	MAX	8.7	MIN	0	AC-FT	329
WTR YR	2010	TOTAL	138.06	MEAN	0.38	MAX	11	MIN	0	AC-FT	274

MAX DISCH: 11.4 CFS AT 20:45 ON Jun. 01,2010 GH 1.08 FT. SHIFT -0.11 FT. (GH CORR -0.03 FT. APPLIED)
 MAX GH: 1.08 FT. AT 20:45 ON Jun. 01,2010 (GH CORR -0.03 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351000 PINER RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WY2010 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2010

Location.-- Weminuche Pass ditch diverts water from left bank of Rincon la Vaca Creek (tributary to Los Pinos River) in sec. 5, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.

Drainage and Period of Record.-- N/A

Equipment.-- Electronic data logger with satellite transmitter, which records gage height data from a float-operated shaft encoder in a CMP shelter and stilling well. One intake pipe attaches well to 5 foot Parshall flume.

Hydrologic Conditions.--

Gage-Height Record.-- Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Record is complete and reliable from June 1, 2010 when diversion started to June 18, 2010 when flow ceased. There were also three days with bad data points received due to poor transmitted signal reception. These points were not imported into the records spreadsheet because they were outside of the import limits. There was no flow from Oct. 1, 2009 to May 31, 2010 and from Jun. 19 to Sep. 30, 2010. The shaft encoder was found 0.09 ft. too high on Jun. 9, 2010, but the correction to the instrument was not made. It was assumed that the shaft encoder was set 0.09 ft. high when diversion was started and DOW personnel verified that it was never corrected. Therefore a -0.09 ft. gage-height correction was applied to all data for this water year.

Datum Corrections.-- The flume is in good condition.

Rating.-- Rating WEMDITCO05, a standard 5 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. There was one discharge measurement, (No. 54) made this year. Since 1997, eight measurements have been made and the shifts varied from -0.01 to -0.03 ft. This year's measurement was made on Jun. 9, 2010 and resulted in a shift of -0.03 feet. The peak flow of 30.0 cfs occurred at 1900 on Jun. 5, 2010 at a gage height of 1.32 feet, (gage height corr. of -0.09 ft. applied) with a shift of -0.03 feet. It exceeded measurement No. 54 (GH = 0.97), by 0.35 feet in stage.

Discharge.-- The measured shift of -0.03 feet was distributed through the entire period of record. Discharge measurements indicate that this shift would be accurate through all ranges in stage encountered.

Special Computations.--

Remarks.-- Record is good for the period of record. Station maintained by Div 3 hydrographic staff and record developed by Lee Conner .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE--

WEMDITCO05 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

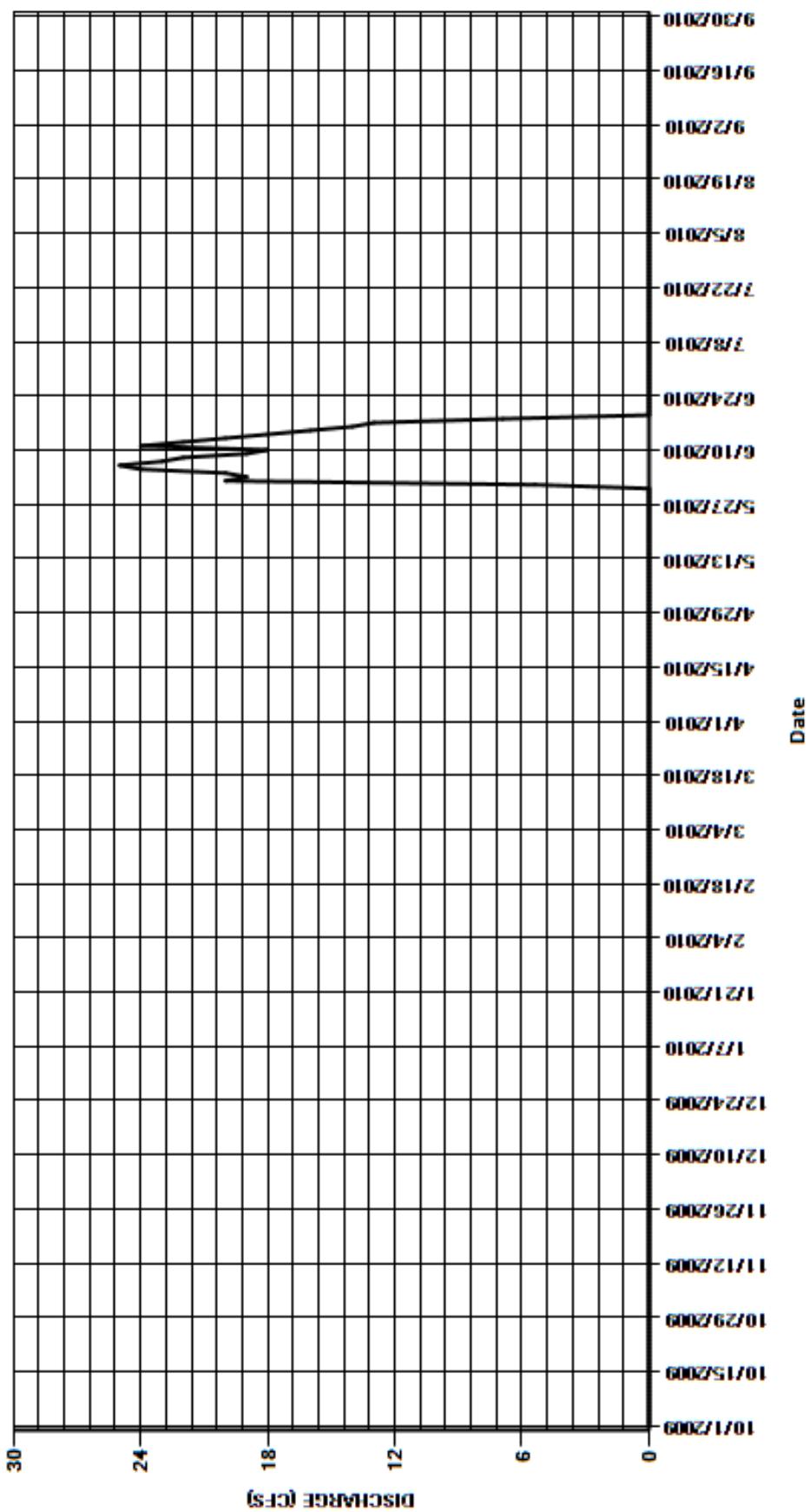
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	5.4	0	0	0
2	0	0	0	0	0	0	0	0	20	0	0	0
3	0	0	0	0	0	0	0	0	19	0	0	0
4	0	0	0	0	0	0	0	0	20	0	0	0
5	0	0	0	0	0	0	0	0	24	0	0	0
6	0	0	0	0	0	0	0	0	25	0	0	0
7	0	0	0	0	0	0	0	0	23	0	0	0
8	0	0	0	0	0	0	0	0	22	0	0	0
9	0	0	0	0	0	0	0	0	19	0	0	0
10	0	0	0	0	0	0	0	0	18	0	0	0
11	0	0	0	0	0	0	0	0	24	0	0	0
12	0	0	0	0	0	0	0	0	22	0	0	0
13	0	0	0	0	0	0	0	0	20	0	0	0
14	0	0	0	0	0	0	0	0	18	0	0	0
15	0	0	0	0	0	0	0	0	16	0	0	0
16	0	0	0	0	0	0	0	0	14	0	0	0
17	0	0	0	0	0	0	0	0	13	0	0	0
18	0	0	0	0	0	0	0	0	6.9	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	---	0	0	0	0	0	0	0
30	0	0	0	0	---	0	0	0	0	0	0	0
31	0	---	0	0	---	0	---	0	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	329.30	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0	0	11	0	0	0
AC-FT	0	0	0	0	0	0	0	0	653	0	0	0
MAX	0	0	0	0	0	0	0	0	25	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	427.24	MEAN	1.17	MAX	15	MIN	0	AC-FT	847
WTR YR	2010	TOTAL	329.30	MEAN	0.9	MAX	25	MIN	0	AC-FT	653

MAX DISCH: 30 CFS AT 19:00 ON Jun. 05,2010 GH 1.32 FT. SHIFT -0.03 FT. (GH CORR. -0.09 FT. APPLIED)
 MAX GH: 1.32 FT. AT 19:00 ON Jun. 05,2010 (GH CORR. -0.09 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
MUDDY CREEK ABOVE PAONIA RESERVOIR
Water Year 2010

Location.--	Lat. 38°59'15", Long. 107°20'53", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec 28, T.12 S., R.89 W. in Gunnison County on the right bank 700 ft. downstream from county bridge and 1400 ft. upstream from high water line of Paonia Reservoir.
Drainage and Period of Record.--	
Equipment.--	Graphic water-stage recorder (Stevens A35) and a shaft encoder with a Sutron 8210 High Data Rate DCP until May 19, 2010 in a 42-inch CMP shelter and well. The graphic recorder and shaft encoder operate from separate floats and are set to an adjustable reference point attached to the instrument shelf. The primary reference gage is a steel drop tape. A Sutron Constant Flow Bubbler is an auxiliary / backup. The gage also has an air temperature sensor. The chart recorder and shaft encoder were replaced by a Sutron Stage Discharge Recorder, and the 8210 DCP was replaced by a Sutron Satlink 2 on May 19, 2010. No other changes.
Hydrologic Conditions.--	The basin is composed of conifer and aspen forest to open sagebrush hillsides. There is some limited irrigation diversion for mountain grass hay up stream. A very large land slide continues to encroach from the east about four miles upstream. This process is more active in the spring and during high ground water conditions.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data down with chart record and SDR log data as backup. The record is complete and reliable, except for periods when ice affected the stage-discharge relationship: Nov 17-22, 24-30, Dec 1-31, 2009, Jan 1-13, 25-28, Feb 2-6, 9, 14-17, 23-25, 27, 2010. Data from the bubbler gage were used when low flows allowed oil to leak from the oil cylinder consequently causing the float to freeze. There were two primary sensor calibration corrections and one flush correction this year. The shaft encoder was corrected +0.01 ft. at 1430 on Oct 18, 2009 and a bubbler correction of +0.04 ft was made at 1030 on Feb. 16, 2010. The flush correction was +0.07 ft. at 0615 on Apr 22, 2010 was distributed by time back to the previous inflection (0.00) at 2100 on Apr 21, 2010.
Datum Corrections.--	Levels were not run this year. Levels were last run to the adjustable RP, located inside the gage shelter, on August 28, 2007, using the RP as the base.
Rating.--	The stream bed is composed of medium to large sized cobble. During spring runoff the channel is fairly stable at the gage site. There is an encroaching shelf of cobble moving downstream from above. The left bank is flat at the gage and then pinches into a steep cliff about 50 feet downstream. The right bank is flat brush and mixed conifer. Sheet flow occurs on the right bank during high water. When this happens, water has been a foot deep at the gage house. During low flows in the range of 10 to 20 cfs an irregular medium cobble riffle is a section control about 10 to 20 feet below. During medium flows the channel is the control. During high flows the channel is the control with some influence by the brush on the right side and the constriction by the cliff on the left side. During extremely high flows the brush on the right, the cliff on the left and possibly a large boulder on the left all have greater influence on the channel control. The heavy sediment load settles out when the velocities drop and are deposited on the stream bed. The slope at and below the gage doesn't allow the sediment to completely bury the cobble, but it does significantly smooth the cobble character of the stream bed. Rating MUDAPRC08B was used the entire water year. It incorporated the highest measurement made in recent years. There were 13 measurements (372 – 384) made this year. They cover the range in stage from 5.21 to 7.40 ft. These compare to the range of recorded stage from a low of 5.02 to a high of 7.89 ft. Measurements cover the range in flow experienced, except the lower mean daily flows of Oct 1-2, Nov 24, Dec 2-31, 2009, Jan 1-31, Feb 1-16, Sep. 3-7, 2010; and the higher mean daily flows of Apr 21, 22, 2010. The instantaneous peak flow of 1270 cfs occurred at 2145 on Apr 21, 2010 at a gage height of 7.89 ft. with a shift of +0.04 ft. It exceeded the stage of measurement No. 379 made Apr. 22, 2010 by 0.49 ft.
Discharge.--	Shifts were distributed by time from 1400 Oct 16, 2009 to 1200 Mar 18, 2010. There were three variable shift tables used to distribute shifts by stage the rest of the water year. These were MUDAPR10_VsA (applied from 0000 Oct 1, 2009 to 1300 Oct 16, 2009); MUDAPR10_VsB (applied from 1300 Mar 18, 2010 to 1400 Jun 2, 2010); and MUDAPR10_VsC (applied from 1500 Jun 2, 2010 to 2345 Sep 30, 2010). All measurements were given full weight except Nos. 380, 381 and 382 which were discounted from -2% to +3% to smooth shift distribution.
Special Computations.--	Discharge during ice-affected periods was estimated using partial day record, adjacent good days, and temperatures from the temperature sensor located at this site. The strip chart was compared to the four winter measurements and the temperature data. A spreadsheet was used to calculate the inflow by comparing the change in storage for Paonia Reservoir and the outflow at the discharge gage, Muddy Creek below Paonia Reservoir (MUDBPRCO). The ice period of Muddy Creek above Paonia Reservoir was graphed against the calculated inflow and whenever the graph was greater than the calculated trace then that period was evaluated. A hydrograph was used.
Remarks.--	The record is good, except for the periods when the stage-discharge relationship was affected by ice, which were estimated and should be considered poor. Gage maintained and operated by Gerald M. Thrush and Stephen W. Tuck and record developed by Gerald M. Thrush.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MUDDY CREEK ABOVE PAONIA RESERVOIR

RATING TABLE--

MUDAPR008B USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

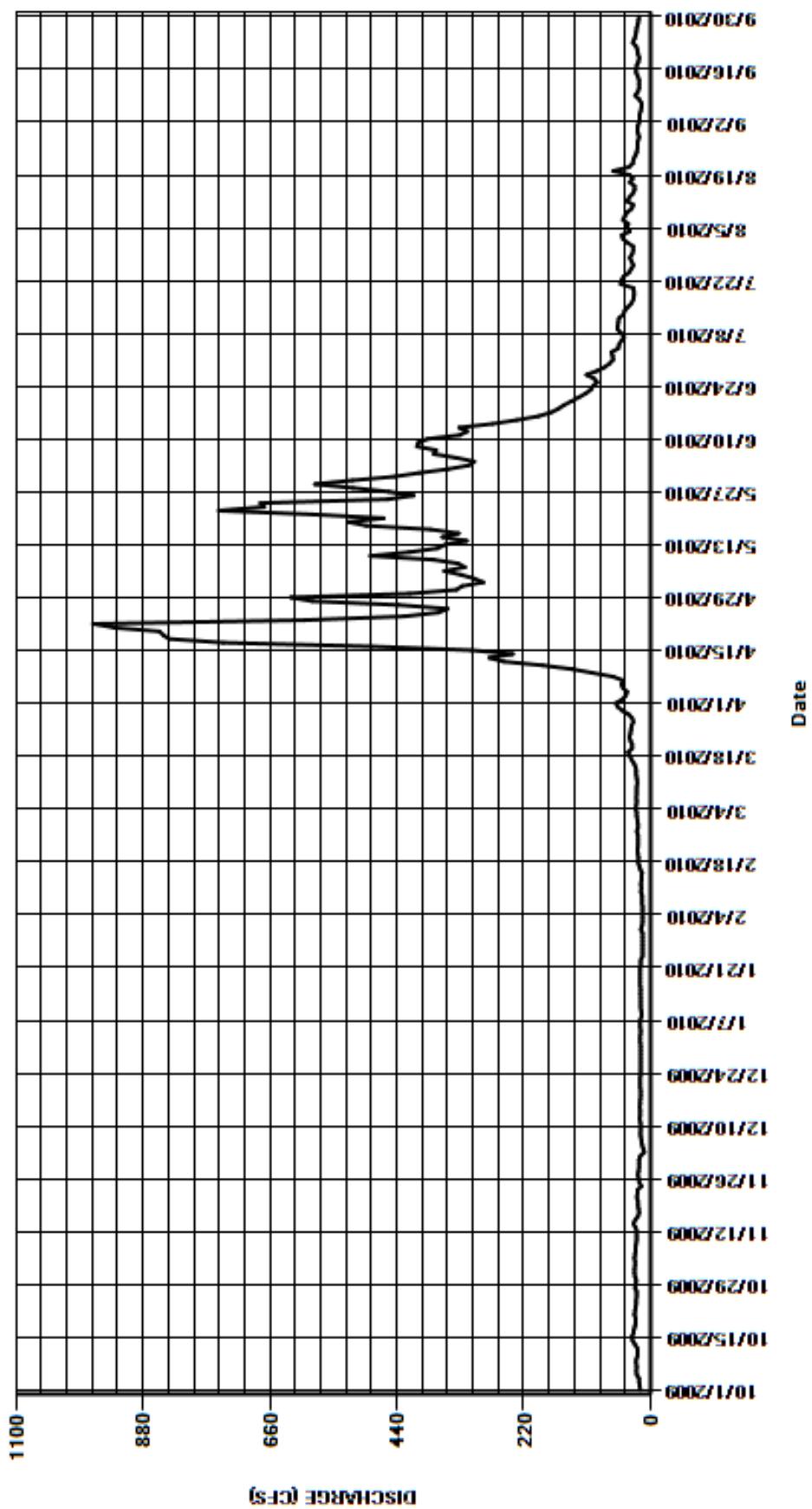
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	28	20	18	15	23	60	337	401	65	40	22
2	19	28	18	18	14	24	49	327	351	66	48	20
3	20	27	11	18	14	24	43	290	315	68	50	19
4	20	27	13	17	14	26	41	306	306	56	36	19
5	24	28	15	18	14	25	48	329	337	55	41	17
6	25	27	16	18	14	24	51	358	376	51	39	16
7	24	26	17	18	15	25	47	322	372	46	48	16
8	25	26	18	16	15	24	65	334	405	51	45	20
9	25	25	17	16	15	24	101	377	403	57	41	27
10	23	24	17	17	17	24	136	486	387	57	33	22
11	23	24	18	17	16	23	187	418	331	56	30	20
12	23	24	19	17	17	24	255	370	318	55	41	20
13	27	26	18	17	16	25	280	356	332	47	37	20
14	31	30	18	18	16	25	239	319	274	45	31	22
15	33	27	19	17	15	26	310	361	232	39	28	25
16	30	22	18	18	18	29	484	333	195	33	28	25
17	29	20	18	18	20	33	741	381	173	30	36	24
18	27	21	17	18	22	36	835	493	160	29	31	21
19	26	22	17	18	21	39	845	525	150	29	37	20
20	26	22	18	18	22	32	852	463	137	30	65	22
21	28	24	18	18	23	32	930	585	125	52	38	23
22	27	23	18	17	22	35	967	749	113	51	31	25
23	26	23	18	17	22	37	599	670	104	47	30	31
24	25	16	17	14	22	35	426	677	100	38	27	28
25	25	20	17	14	22	34	368	456	93	34	24	26
26	24	21	17	14	24	33	352	411	98	30	23	25
27	24	22	17	14	22	30	437	454	111	33	23	24
28	27	21	17	14	22	32	586	516	93	36	22	22
29	26	20	17	14	---	38	624	582	80	32	20	21
30	25	20	17	14	---	49	418	517	71	30	22	20
31	27	---	17	17	---	57	---	445	---	30	23	---
TOTAL	782	714	532	517	509	947	11376	13547	6943	1378	1068	662
MEAN	25.2	23.8	17.2	16.7	18.2	30.5	379	437	231	44.5	34.5	22.1
AC-FT	1550	1420	1060	1030	1010	1880	22560	26870	13770	2730	2120	1310
MAX	33	30	20	18	24	57	967	749	405	68	65	31
MIN	18	16	11	14	14	23	41	290	71	29	20	16
CAL YR	2009	TOTAL	54864	MEAN	150	MAX	1140	MIN	11	AC-FT	108800	
WTR YR	2010	TOTAL	38975	MEAN	107	MAX	967	MIN	11	AC-FT	77310	

MAX DISCH: 1270 CFS AT 21:45 ON Apr. 21,2010 GH 7.89 FT. SHIFT 0.04 FT.

MAX GH: 7.89 FT. AT 21:45 ON Apr. 21,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK ABOVE PAONIA RESERVOIR
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
MUDDY CREEK BELOW PAONIA RESERVOIR
Water Year 2010

Location.--	Lat. 38°56'26", Long. 107°21'24" in the SE 1/4 NW 1/4 NE 1/4 sec. 8, T.13 S., R. 89 W. (in Gunnison County on the right hand bank), and about 100 feet above county bridge and about 1100 feet below Paonia Reservoir outlet.
Drainage and Period of Record.--	
Equipment.--	Graphic water-stage recorder and shaft encoder on separate floats in a 42-inch CMP shelter and well. Satellite telemetry equipment is housed in a NEMA box attached to the outside of the CMP shelter. The primary reference gage is steel drop tape referenced to an adjustable reference point inside the gage house. The secondary reference gage is a bank-operated cantilever outside chain gage located just upstream of the station. The shaft encoder was replaced with a Stage Discharge Recorder on 5/19/2010. No other changes this water year.
Hydrologic Conditions.--	The control is a concrete ramp flume. Flows are completely controlled by Paonia Reservoir until the reservoir spills.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with the DCP log, chart record and SDR log used for backup purposes. The record is complete and reliable. There were five shaft encoder corrections, and one correction from cleaning moss and no flush corrections. Shaft encoder calibration corrections were made as follows: -0.02 ft at 1026 1/16/10; 0.02 ft at 1145 4/6/10; -0.01 ft at 1045 4/14/10; -0.01 ft at 1545 7/14/10, and +0.01 ft at 2145 on 9/16/10.
Datum Corrections.--	No levels were run this water year. Levels were last run on August 28, 2007.
Rating.--	During higher flows approaching 800 cfs the banks neck down and the county road bridge piers act as a compound control. The rating table MUDBPRCO09A was used for all of WY 2010. Fourteen discharge measurements were made during WY 2010 (Nos. 354 to No. 365 (with 360 and 362 being double msmts). Measurements ranged from 0.30 cfs to 1080 cfs. They cover the range in stage experienced except for lower mean daily flows on Apr 6-, 2010. There were no days when the average daily flow was higher than 1080 cfs. The peak discharge of 1320 cfs occurred at 1400 on Jun 1, 2010 at gage height of 6.81 ft with a shift of +0.12 ft. It exceeded Meas. 361 made on Apr 22, 2010 by 0.40 ft in stage.
Discharge.--	Shifting section control method was used. Shifts were distributed by time from 0000 Oct 1, 2009 to 1200 on Apr 6, 2010 and from 1600 on Jul 14, 2010 to 2035 on Sep 16, 2010. During the rest of the year three variable stage-shift tables were used: MUDBPR10VSA (applied from 1300 Apr 6, 2010 to 1050 Apr 22, 2010); MUDBPR10VSB (applied from 1100 Apr 22 to 1500 Jul 14, 2010) and, MUDBPR10VSC (applied from 2100 Sep 16, 2010 to 2345 Sep 30, 2010). Measurements showed shifts ranging from -0.01 to +0.18 ft. All measurements were given full weight except measurement 362_A which was discounted 3% for smoothing purposes.
Special Computations.--	There was an observation of drawdown in the stilling well. Reference readings taken on Apr 22, 2010 indicate the outside cantilever gage read 0.16 feet higher than the drop tape readings taken inside the gage house. The wave action and turbulent conditions associated with the high flows at this gage appear to cause a drawdown affect inside the stilling well. The measured shifts at the higher flows absorb and offset the drawdown affect in the well. The high flow measurement made this water (Meas. No. 361) had a shift of +0.12 feet. The observation of virtually zero flow on the Apr 6, 2010 of an estimated 0.30 cfs has been evaluated in light of the Interstate Compact release runs on the Arkansas River which are considered spent whenever they reach 5% of the released value. In some instances they are considered spent at 8% of the released value. The lowest, adjacent mean daily flow was 40 cfs. 5% of 40 cfs is 2 cfs. Therefore compared to the adjacent 40 cfs value anything less than 2 cfs is zero. That same observation noted that the reservoir was shut down for concrete repairs. This indicates that the flow seen was from a small spring or residual bank storage. Furthermore, the main purpose of the gage is to measure the releases from Paonia Reservoir and that release was zero. The following shift value was used during the low flow period seen on the 6th and 7th of April, and this has had the effect of zeroing out these minuscule flows which were well below 5%. The estimated flow was less than 1 % of the lowest adjacent flow which in and of itself held some of these same low flows.
Remarks.--	The record is good. Gage operated by Stephen Tuck and Jerry Thrush, and record developed by Jerry Thrush.
Recommendations.--	The Water Commissioners and Dam Tender checking this station should be encouraged to sign and date the chart when they make an inspection. The rating needs to be reviewed and revised especially on the upper end. Levels should be run.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MUDDY CREEK BELOW PAONIA RESERVOIR

RATING TABLE--

MUDBPRCO09A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	19	13	14	20	30	54	488	756	78	78	176
2	30	19	13	14	21	30	54	428	440	71	64	189
3	30	19	13	14	21	30	73	428	116	71	31	191
4	30	19	13	17	21	30	104	426	306	67	24	192
5	30	18	13	22	21	30	40	427	410	59	31	191
6	24	18	13	22	21	30	0	428	476	55	55	203
7	19	18	13	22	21	30	0	428	509	50	87	207
8	19	18	13	22	23	29	129	428	510	49	87	195
9	19	23	13	22	28	30	204	431	538	80	91	186
10	19	28	13	22	28	30	202	436	532	81	105	195
11	19	28	13	21	28	30	201	441	489	80	127	198
12	18	28	13	21	28	30	244	328	430	81	112	196
13	18	28	13	21	28	30	451	269	405	83	113	197
14	18	28	13	21	28	30	404	271	365	105	128	205
15	18	28	13	21	28	30	648	170	285	134	139	204
16	19	27	13	22	28	30	635	117	278	134	154	205
17	19	27	13	22	28	30	636	117	247	134	152	200
18	19	27	13	22	28	30	652	119	217	146	151	195
19	19	27	13	22	28	31	740	122	190	158	151	193
20	19	27	13	21	28	31	892	126	183	162	105	192
21	19	27	14	22	27	31	1030	110	165	131	109	189
22	19	27	14	22	27	31	1080	111	119	119	139	183
23	18	27	14	22	27	31	871	114	117	115	139	178
24	18	27	14	22	28	31	708	115	114	120	142	73
25	18	27	14	21	28	32	505	117	109	137	152	28
26	18	27	14	21	30	32	384	117	106	156	158	28
27	14	27	13	21	30	32	390	119	109	156	169	26
28	16	27	14	21	30	32	552	120	102	108	170	24
29	28	27	14	21	---	32	702	122	92	88	170	22
30	25	21	14	21	---	32	705	296	87	110	174	21
31	19	---	14	21	---	39	---	566	---	110	176	---
TOTAL	648	738	413	640	732	956	13290.00	8335	8802	3228	3683	4682
MEAN	20.9	24.6	13.3	20.6	26.1	30.8	443	269	293	104	119	156
AC-FT	1290	1460	819	1270	1450	1900	26360	16530	17460	6400	7310	9290
MAX	30	28	14	22	30	39	1080	566	756	162	176	207
MIN	14	18	13	14	20	29	0	110	87	49	24	21

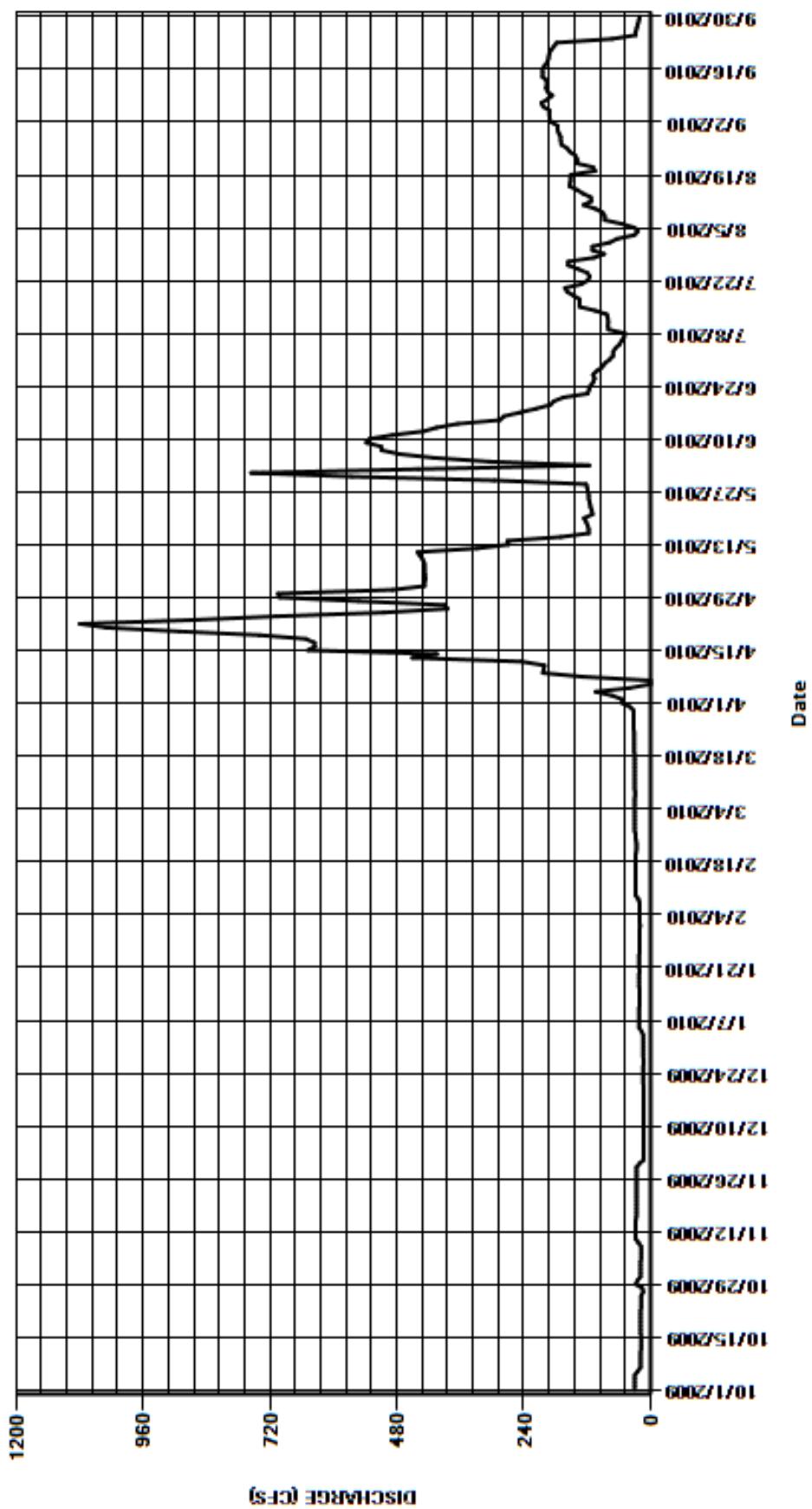
CAL YR	2009	TOTAL	61446.30	MEAN	168	MAX	1100	MIN	0	AC-FT	121900
WTR YR	2010	TOTAL	46147.00	MEAN	126	MAX	1080	MIN	0	AC-FT	91530

MAX DISCH: 1320 CFS AT 14:00 ON Jun. 01,2010 GH 6.81 FT. SHIFT 0.12 FT.

MAX GH: 6.81 FT. AT 14:00 ON Jun. 01,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK BELOW PAONIA RESERVOIR
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN

ABC LATERAL

Water Year 2010

Location.--	Lat. 38°29'06", Long. 107°44'57", in SE 1/4 NE 1/4 NE 1/4 sec. 27, T.49 N., R.8 W., Montrose County, on left bank of canal 270 ft. below takeout from South Canal, such takeout being 1700 ft. below the west portal of the Gunnison Tunnel.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron 8210 Satlink 2 HDR data collection platform with shaft encoder (SDR) and graphic chart recorder (till 05/19/2010) in a 36 in. diameter CMP shelter and a 24 in CMP stilling well. The recorder and shaft encoder operate from separate floats and are set to an inside drop tape referenced to an adjustable RP on the instrument shelf. The SE was replaced with a SDR and the strip chart recorder was removed on 5/19/2010. The control is a broad crested concrete structure about 12-feet below the gage. A wooden bridge at the gage is used to make flow measurements.
Hydrologic Conditions.--	The AB and C Drop aka the AB Lateral Canal is part of the Gunnison Tunnel complex. The South Canal is the other part. The two structures are combined to account for the total diversion through the Gunnison Tunnel. Generally there is very little ice effect due to the warm thermal properties of the water. At times snow will blow onto the control and this probably has some effect, but this is barely distinguishable on the chart and has been ignored. The AB Lateral is a man made structure. The control is a concrete broad crested weir that is 100% controlled. Two gates are set located below the control. One gate is used to deliver water to Cedar Creek while the other controls the flows on the AB and at Lateral through a concrete flume. At times both gates can be operated in a cause such a way that causes the control to become 100% submerged. Heavy moss growth on the control causes variability in the stage-discharge relationship, varying degrees of backwater with up to 100% submergence.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record, SDR log, and DCP log as backup. The record is complete and reliable, except for one period when the control was submerged from April 19-May 6, 2010 due to the gates downstream being closed and causing water to backup into the control. The gage was visited on 21 separate occasions to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted on 4 separate occasions (Feb 8, Apr 7, May 19, Jul 16, 2010). The corrections ranged in magnitude of -0.02 to 0.01 ft. Shaft encoder corrections were prorated between inspections and measurements where these were appropriate. Our policy is not to make a shaft encoder correction for less than 0.02 ft. This takes the factors of bounce, float lag, and the point of change on the shaft encoder into account. This allows more consistent readings. We will change a shaft encoder value for 0.01 ft., if that same relationship was observed at the last visit. These instances have been carried back to the visit before the last observation. Moss was removed from the control causing corrections to the gage height record. The corrections were prorated by time through the record within the shift and datum distributions. The operating period of the canal was from Oct. 1, 2009 to Oct. 29, 2009 and from April 8, 2010 through Sep. 30, 2010. The intervening winter period, consisted of seepage from the Gunnison Tunnel. This winter shut down period is a normal operational occurrence. This year there were 10 occurrences of increased flow during winter shutdown period. These were periods when the Gunnison Tunnel was turned on to fill Fairview Reservoir and the AB Lateral head gate was left open. The period of Nov 3-13 exhibited increased flow because the City of Montrose was dumping water from Montrose Reservoir.
Datum Corrections.--	Levels were last run on Aug. 15, 2006 using bench mark No. 1 (BM#1) as the base. No corrections were made as the RP and drop tape were found to be within the allowable tolerances.
Rating.--	The channel is concrete lined above and below the control section. The left side is a smooth trapezoidal shape. The right side is a smooth trapezoidal shape with a square step at the bottom. The concrete has been repaired in places and this has broken off in places. The condition is decomposed concrete to smooth. The control is a broad crested concrete structure about 12 ft. below the shelter stilling well intakes. During certain periods of operation the gate/flume over Cedar Creek and the gate for the Cedar Creek drop, approximately 200 ft downstream, act as a compound or two-stage control. Rating ABCLATCO02 was used for the entire Water Year. The rating is well defined to 230 cfs. The moss growth during the later part of the year caused negative shifts. Eleven discharge measurements (Nos. 309-319) were made this year ranging in discharge from 0.76 cfs to 115 cfs. These measurements cover the range in stage experienced except the lower flows seen Oct 30-Nov 2, 2009 and Mar 25-27, 2010. The peak instantaneous flow of 117 cfs occurred at 1730 October 5, 2010 at a gage height of 3.04 ft with a shift of +0.01 ft. It exceeded measurement No. 316, made June 28, 2010 by 0.04 ft in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were prorated by time from 1500 May 03, 2010 to 1300 May 13, 2010 and from 2100 September 14, 2010 to the end of water year. During the remainder of the water year five variable stage-shift relationships were applied. ABCLAT_2010VS1 (applied from 0000 October 1, 2009 to 1530 November 18, 2009) was used to define the period at the end of the irrigation season when the lateral was turned down for winter operations (values from measurements 307-310 were used). ABCLAT_2010VS2 (applied from 1600 November 18, 2009 to 1400 May 03, 2010). It was used during the winter period through the spring start up (values from measurements 310-313 were used). ABCLAT_2010VS3 (applied from 1400 May 13, 2010 to June 7, 2010). It was used between measurements 314 and 315, and used values from these measurements. ABCLAT_2010VS4 (applied from 1500 June 7, 2010 to 1500 June 28, 2010). It was used between measurements 315 and 316, and used values from these measurements. ABCLAT_2010VS5 (applied from 1600 June 28, 2010 to 2000 September 14, 2010). It was used between measurements 316 through 319, and used values from these measurements. Measurements showed shifts varying between -0.06 and +0.05 feet. All were given full weight except Nos. 309 and 318 which were discounted from -2% to +1% to smooth shift distribution.
Special Computations.--	The backwater estimates were calculated from adjacent days before and afterwards using the base winter flows. Backwater estimates for operational flows employed partial days associated with gate changes and observations of partial days and measurements 311-314 made preceding, during and following the period. The instrument calibrations and control corrections that overlapped were entered in a separate spreadsheet and then the breakpoints for these simultaneous series were entered into the program.

Remarks--

The record is good, except for periods when the flow was estimated due to back water: April 19-May 6, 2010, which should be rated as fair since two measurements were made during this period with fairly stable gage heights. Station maintained and record developed by Gerald M. Thrush.

Recommendations--

A flush riser needs to be installed. The riser will need to placed at Aan angle outside gage in order to miss the measurement bridge.should be installed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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ABC LATERAL

RATING TABLE--

ABCLATCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

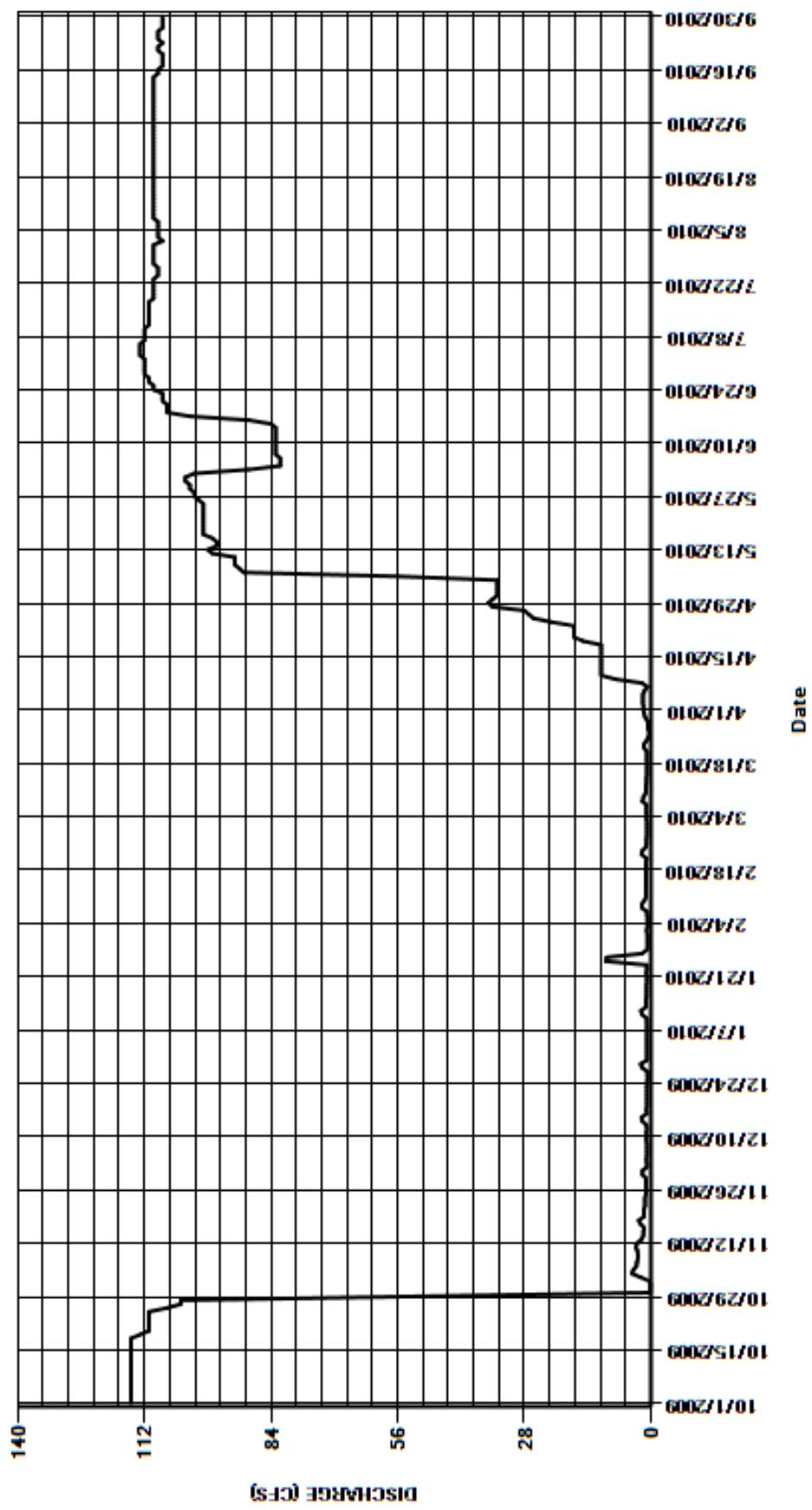
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	115	0.1	1.9	0.93	0.81	0.93	1.7	34	103	112	110	110
2	115	0.24	0.93	0.93	0.98	0.93	1.7	34	101	112	108	110
3	115	2.2	0.92	0.93	0.81	0.97	1.8	34	89	113	109	110
4	115	4.2	1	0.94	0.82	0.98	1.8	34	82	113	109	110
5	115	3.9	0.93	0.93	0.83	1	1.8	34	82	113	109	110
6	115	3.2	0.93	0.93	0.85	1	1.4	56	82	113	109	110
7	115	3.1	0.92	0.93	0.89	1	0.82	90	83	112	109	110
8	115	2.9	0.93	0.93	2	1.9	2	91	83	112	110	110
9	115	2.9	0.99	0.97	2	1.7	7.9	92	83	112	110	110
10	115	3	1	0.93	1.4	1.2	11	92	83	112	110	110
11	115	3.4	1	2	1.1	1.1	11	92	83	111	110	110
12	115	3	0.93	2.2	1.1	1.1	11	97	83	111	110	110
13	115	2.1	1	1.1	1.1	1	11	98	83	111	110	110
14	115	1.7	1.9	1.1	1.1	1	11	96	83	111	110	110
15	115	1.7	2.1	1.1	1.1	0.91	11	96	84	111	110	109
16	115	1.5	0.93	1	1.1	0.91	11	97	89	111	110	109
17	115	2.3	1	0.96	1.1	0.93	11	99	102	111	110	108
18	115	2.7	0.93	0.96	1.1	0.93	11	99	107	110	110	108
19	113	1.5	0.93	0.96	1.1	0.96	15	99	107	110	110	108
20	111	1.5	0.93	0.94	1.1	0.93	17	99	107	110	110	108
21	111	1.5	0.93	0.96	1	0.93	17	99	108	110	110	109
22	111	1.3	0.93	0.99	2.1	1.5	17	99	108	110	110	109
23	111	1.3	0.93	0.93	1.9	1.5	17	99	108	110	110	108
24	111	1.3	0.89	0.93	1.1	0.91	22	99	110	109	110	109
25	111	1.1	0.81	10	1	0.51	26	99	110	109	110	109
26	107	1.1	0.81	9.8	0.98	0.36	27	100	111	109	110	109
27	104	1.1	0.82	2	0.93	0.7	28	101	111	110	110	108
28	104	1.1	1.9	0.86	0.93	0.69	35	101	112	110	110	108
29	54	1.1	2.3	0.81	---	0.76	36	102	112	110	110	108
30	0.14	1.9	0.93	0.81	---	1.3	35	102	112	110	110	108
31	0.15	---	0.93	0.81	---	1.5	---	103	---	110	110	---
TOTAL	3218.29	59.94	34.28	50.57	32.33	32.04	411.92	2667	2901	3438	3403	3275
MEAN	104	2	1.11	1.63	1.15	1.03	13.7	86	96.7	111	110	109
AC-FT	6380	119	68	100	64	64	817	5290	5750	6820	6750	6500
MAX	115	4.2	2.3	10	2.1	1.9	36	103	112	113	110	110
MIN	0.14	0.1	0.81	0.81	0.81	0.36	0.82	34	82	109	108	108
CAL YR	2009	TOTAL	19897.40	MEAN	54.5	MAX	125	MIN	0	AC-FT	39470	
WTR YR	2010	TOTAL	19523.37	MEAN	53.5	MAX	115	MIN	0.1	AC-FT	38720	

MAX DISCH: 117 CFS AT 17:30 ON Oct. 05,2009 GH 3.04 FT. SHIFT 0.01 FT.

MAX GH: 3.04 FT. AT 17:30 ON Oct. 05,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ABC LATERAL
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
SOUTH CANAL NEAR MONTROSE
Water Year 2010

Location.--	Lat. 38°29'01", Long. 107°45'20", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec 27, T.49 N., R.8 W., Montrose County, on right bank of canal approximately 3600 ft. below the west portal of the Gunnison Tunnel.
Drainage and Period of Record.--	N/A.
Equipment.--	Graphic water-stage recorder and a Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 2 DCP in a 42-inch diameter CMP shelter and well. The strip chart recorder was removed on May 19, 2010. The primary reference is a steel drop tape referenced to an adjustable brass nut mounted on the wood instrument shelf. The recorder and SDR operate from separate floats. No other changes this water year.
Hydrologic Conditions.--	A manmade structure which is a 100% controlled diversion. Winter and spring the natural gravel bar and two step concrete drop structure act as the main control for the gage. As late spring into summer and fall the willow / salt cedar and moss growth within the channel drown out the control. Large negative shifts occur as a result of the aquatic growth.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart and DCP download data as backup. The record is complete and reliable. There are periods, just after the fall shut down and after the 10 winter runs when there is a small amount of water observed below the level of the inlets. These trailing off values are below the 5% threshold of the total mean winter values and have been ignored as minuscule bank storage. There was one SDR calibration correction of -0.01 ft made on 07/15/2010.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Aug. 15, 2006, using BM No.1 as a base. BM 1, 2 and 3 were adjusted by -0.33 ft. due to the difference in the assumed RP elevation (21.00 ft.) and the actual tape length (20.67). The RP elevation was set to the tape length. BM #2 was found to be reading 0.03 ft. high and was adjusted to an elevation of 11.504 ft. No corrections were made to gage heights, measurements or charts
Rating.--	Control is a transition above a two step concrete drop structure. The low water control is natural gravel bar about 100 feet below the gage. Intermediate and high water control is the concrete transition structure located approximately 4,000 feet below the gage. Rating No. 16b dated November 1, 2008 was used the entire water year. Thirteen discharge measurements (Nos. 388 - 400) were made during the water year ranging in discharge from 105 to 1000 cfs. Observations of zero flow were made at 1615 on November 9, 2009 and at 1420 on January 05, 2010. Measurements and observations of zero flow cover the range in flow experienced. The peak flow of 1000 cfs occurred at 1200 July 15, 2010 at a gage height of 3.41 ft with a shift of -0.20 ft. It did not exceed the maximum flow of measurement No. 398, made July 15, 2010. The highest recorded stage (3.85 ft. at 1745 on Sep. 20, 2010) exceeded the stage of measurement No. 400, made on September 14, 2010 by 0.04 ft. in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by 5 variable stage-shift relationships. SOUCAN10VSA (applied from 0000 October 1, 2008 to 2345 November 15, 2009), SOUCAN10VSbw (applied from 0000 November 16, 2009 to 2300 December 27, 2009), SOUCAN10VScw (applied from 0000 December 28, 2009 to 2300 February 21, 2010), SOUCAN10Vsdw (applied from 0000 February 22, 2010 to 0800 March 30, 2010), SOUCAN10VSE (applied from 0900 March 30, 2010 to 2355 September 30, 2010). Ten winter tunnel runs were made this water year and these occurred between Meas. No. 389 and 390. At the beginning of the water releases on Dec. 28, 2009 and Feb. 22, 2010 spikes in the gage height record were observed. The spikes were assumed to be formed by the initial surge of water flushing ice from the channel and lodging it on the control. The continuous flow of warmer water released from Crystal Reservoir melts and flushes the ice from the control along with the gravel that controls the stage-discharge relationship at low flows. The two spikes seen on winter tunnel runs were used to distribute shift values from -0.01 to +0.01 (# 389 to #390). Measurements show unadjusted shifts varying from -0.96 ft to +0.21 ft. All were given full weight and applied directly except for measurement numbers 392, 394 and 396 which were discounted from -3% to + 5% to smooth shift distribution.
Special Computations.--	The largest value (0.005cfs) estimated during the trail off flows seen at shut downs is less than 1 % of the total run and have been assigned a value of 0.00 cfs. The convention used by loss studies associated with the Arkansas River Compact of breaking off releases / deliveries at 5% or even 8% is a supporting argument for this decision.
Remarks.--	The record is good. Station maintained and record developed by Gerald M. Thrush.
Recommendations.--	The enormity of the gage pool makes the moss growth compound the negative shifts which are seen. The condition of a very large gage pool and a virtual channel control even without the aquatic growth makes the gage height much less sensitive to changes in the flow regimen. It is impractical to make any more frequent measurements, and even if it were there are instances when a particular stage or step / gate change isn't measured before another or next gate change takes place. We can only assume that the relationship between measurements is linear with a V Shift or when prorating by time. It has been suggested using an ADVM upstream. The site is concrete lined, is fairly close to the exit of the West Portal of the Gunnison Tunnel, has fairly high velocities which would minimize moss accumulation. The expense for the equipment and to relocate the gage would be high. The new site would need a bank operated cableway to use for conventional and ADCP measurements. An velocity index rating would be needed and would be an additional investment of time. The benefits, however, would be far reaching. The time spent on frequent measurements to account for moss growth could be directed to other gages and projects. Confidence in the flow through the Gunnison Tunnel would be tremendously improved. The gage at the AB Lateral would still have to be operated. Changes in the firmware of the Stream Pro as well as WinRiver II make the SP more sensitive to bottom conditions. Moss buildup and more variation in transects, especially noted in width suggests that better measurements are to be had with the Rio Grande Workhorse using differential GPS. The Rio needs to be used whenever the depth is adequate.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CANAL NEAR MONTROSE

RATING TABLE--

SOUCANCO16b USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

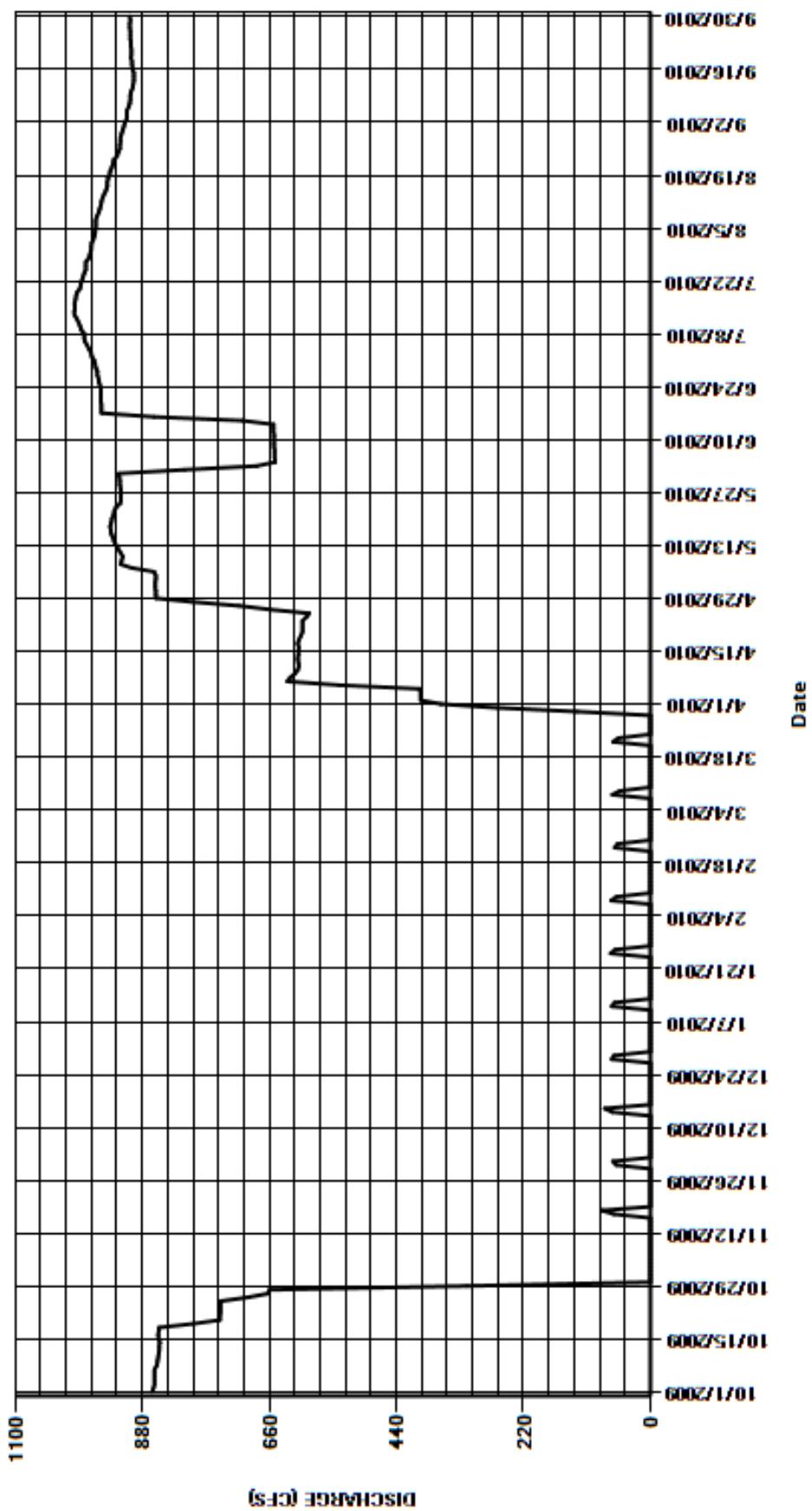
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	863	0	65	0	0	0	363	857	921	964	968	912
2	861	0	0	0	0	0	398	858	807	968	965	910
3	859	0	0	0	0	0	398	858	682	969	963	907
4	859	0	0	0	0	0	398	857	650	973	962	907
5	859	0	0	0	0	0	400	857	651	976	961	907
6	859	0	0	0	0	0	539	860	651	980	961	904
7	859	0	0	0	0	0	629	898	651	981	961	902
8	855	0	0	0	68	66	624	918	652	981	959	901
9	854	0	0	0	59	53	616	916	652	986	956	901
10	853	0	0	0	0	0	611	914	652	988	954	900
11	852	0	0	67	0	0	609	918	652	991	952	897
12	851	0	0	62	0	0	610	922	653	994	951	896
13	851	0	0	0	0	0	611	926	653	998	949	895
14	850	0	66	0	0	0	610	929	653	998	946	895
15	852	0	79	0	0	0	610	931	707	997	943	895
16	853	0	0	0	0	0	609	934	860	998	941	897
17	852	63	0	0	0	0	611	935	951	996	941	898
18	851	84	0	0	0	0	609	936	951	995	940	898
19	792	0	0	0	0	0	606	934	951	993	937	900
20	746	0	0	0	0	0	603	933	952	988	936	899
21	746	0	0	0	0	0	603	930	952	987	933	899
22	745	0	0	0	62	65	603	929	952	985	931	900
23	745	0	0	0	57	55	603	926	952	983	930	900
24	745	0	0	0	0	0	596	919	953	981	924	901
25	744	0	0	69	0	0	591	917	955	978	922	901
26	697	0	0	61	0	0	659	918	956	978	919	901
27	662	0	0	0	0	0	713	917	958	978	919	902
28	660	0	67	0	0	0	792	918	958	973	918	902
29	318	0	63	0	---	0	857	919	961	971	918	901
30	0	59	0	0	---	127	857	919	962	969	916	902
31	0	---	0	0	---	265	---	920	---	969	914	---
TOTAL	22993.00	206.00	340.00	259.00	246.00	631.00	17938	28223	24511	30466	29190	27030
MEAN	742	6.87	11	8.35	8.79	20.4	598	910	817	983	942	901
AC-FT	45610	409	674	514	488	1250	35580	55980	48620	60430	57900	53610
MAX	863	84	79	69	68	265	857	936	962	998	968	912
MIN	0	0	0	0	0	0	363	857	650	964	914	895
CAL YR	2009	TOTAL	186240.00	MEAN	510	MAX	975	MIN	0	AC-FT	369400	
WTR YR	2010	TOTAL	182033.00	MEAN	499	MAX	998	MIN	0	AC-FT	361100	

MAX DISCH: 1000 CFS AT 12:00 ON Jul. 15,2010 GH 3.41 FT. SHIFT -0.2 FT.

MAX GH: 3.85 FT. AT 17:45 ON Sep. 20,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CANAL NEAR MONTROSE
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
UNCOMPAGRE RIVER NEAR OLATHE

Water Year 2010

Location.--	Lat. 38°36'05", Long. 107°58'58", SW $\frac{1}{4}$ SW $\frac{1}{4}$ of NW $\frac{1}{4}$ sec. 15, T.50 N., R. 10W, NMPM, and about 3,100 ft. above the S. H. 348 bridge and about 5,100 ft below the East Canal headgate and diversion structure, both stream distance. The gage is on the right bank and in Montrose County.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic stage recorder and Sutron SatLink Logger 2 with a stage discharge recorder (SDR) in a 48-in spiral corrugated metal shelter and stilling well. Graphic water recorder was removed on Jul. 2, 2010 and the SDR was activated by separate floats in the stilling well. The primary reference gage is a steel drop tape referenced to an adjustable RP located in the gage on the instrument shelf.
Hydrologic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter as the releases from Ridgway Reservoir and the geothermal water from the upper Uncompahgre River in the Ouray area, help to keep the River at this point virtually free of ice. The Uncompahgre River is controlled by releases from Ridgway Reservoir and imported water through the Gunnison Tunnel during periods of low flow. The canals of the Uncompahgre Project affect the amount of discharge at this gage. The East Canal is immediately upstream, and the Ironstone Canal is above that. The automatic gates on the Ironstone cause the gage height to be very uneven as the gates seek their set level. Moss growth at low flows can change the control in just a few days.
Gage-Height Record.--	The primary record is hourly averages of 5-minute electronic data from the Sutron Satlink Logger. This record is reliable and good, except when the stilling well froze on five distinct times. The periods that the well was frozen are: Dec 4-7, 9-15, 24-31, 2009; Jan 1-6, 9-12 and 14-20, 2010. The strip chart mean daily gage height was used when SDR float tape jumped off the wheel on two occasions. Minor shaft encoder corrections resulting from calibration of the SDR to the inside drop tape were distributed by time when they were appropriate. A flush correction of +0.02 ft was noted at 1230 on Nov 20, 2009. This has been carried back to the inflection at 0000 the same day. There were three SDR calibration corrections made as follows: +0.03 ft on 12/7/09 at 0930, +0.02 ft on 6/9/10 at 1230, and -0.02 ft on 8/6/10 at 1205.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 29, 2007, using BM No. 1 as base.
Rating.--	The control is a natural cobble channel. Rating UNCOLACO8 was developed and put into use February 14, 2010. The highest measurement at that time in the range of 1200 cfs was used to help better define the higher range of the rating. The mid range is similar to previous ratings, 8A and 8B. Thirteen discharge measurements (Nos. 230_A-240, and counting 230 as three) were made during water year 2010. Measurements ranged from 3.39 cfs to 1240 cfs, which covered the range of all the flows seen. The instantaneous peak flow of 1530 cfs occurred at 1345 Jun 9, 2010, at a gage height of 6.16 ft with a shift of -0.10 ft. The peak exceeded the stage of the high measurement No. 237 made Jun 9, 2010 by 0.46 ft.
Discharge.--	A shifting control method was used. Shifts were distributed by time from measurement 231 at 1100 Nov 20, 2009 to measurement No. 232 at 1115 Dec 16, 2009; from measurement No. 232 at 1200 Dec 16, 2009 to measurement No. 233 at 1115 Feb 16, 2010; from measurement 233 at 1200 Feb 16, 2010 to measurement 234 at 1000 Mar 16, 2010; and from measurement 239 at 1200 Aug 13, 2010 to measurement 240 at 1200 Sep 20, 2010. Shifts were distributed by stage using four variable stage-shift relationships: shift curve UNCOLA10VS1 (applied from 0000 Oct 1, 2009 to 1000 Oct 8, 2009); shift curve UNCOLA10VS2 (applied from 1100 Oct 8, 2009 to 1045 Nov 20, 2009); shift curve UNCOLA10VS3 (applied from 1100 Mar 16, 2010 to 1145 Aug 13, 2010) and UNCOLA10VS4 (applied from 1300 Sep 20, 2010 to the end of the water year at 2345 September 30, 2010). Measurements made in water year 2010 showed a range in raw shifts from -0.10 ft to +0.11 ft. All measurements were given full weight and applied except Nos. 232, 236, 238 and 239 which were discounted from -4% to +6% for smoothing purposes.
Special Computations.--	Discharge for periods when there was ice in the well were estimated using good adjacent days and comparing the pattern on the 5-minute electronically generated chart. The portions when the pen trace was jagged rather than smooth probably did have some anchor ice effect. These periods were small and of not great enough significance as to change the mean daily gage height. Further evaluation, also, indicates that the falling stage during the colder time of day is substantiation that anchor ice was not the major contributing factor. The normal pattern for anchor ice is a rising stage building going into the night time hours and a dramatically falling stage when the temperature rises the next morning or mid day whenever the ice releases. Therefore, it was determined that there was no "b" or ice affected days. The coincidence of a falling stage with colder temperatures indicates less flow because the effect of ice is a rising stage, not a decreasing stage.
Remarks.--	The record is rated good, except when the stilling well was frozen which is rated poor. Station maintained by Steve Tuck and Gerald Thrush and record developed by Gerald M. Thrush.
Recommendations.--	The installation of an outside gage would help determine if and when there was drawdown. The rating curve needs to be evaluated at the lower end; there appears to have been scour in the low water control. Meter notes need to note more detail about control / moss conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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UNCOMPAGHRE RIVER NEAR OLATHE

RATING TABLE--

UNCOLACO8 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	274	168	130	127	107	163	249	304	6.8	140	43
2	62	266	162	130	119	115	176	231	240	11	181	47
3	65	243	156	130	117	118	76	157	201	13	258	40
4	68	242	159	130	123	131	52	92	306	8.4	238	34
5	77	239	159	130	118	138	27	63	599	12	529	31
6	74	227	165	129	121	125	17	42	828	8.6	360	28
7	74	221	162	129	119	121	132	75	1020	6.5	312	32
8	70	216	158	120	120	147	238	93	1110	8.6	344	78
9	84	210	156	123	119	141	362	83	1110	12	294	87
10	91	206	153	125	119	131	387	135	1060	11	269	72
11	91	200	153	128	116	130	360	43	955	13	222	86
12	80	193	153	130	112	124	455	26	722	14	225	107
13	66	191	153	130	114	121	468	34	617	9.3	195	117
14	83	214	153	140	116	133	267	35	443	7	172	87
15	102	208	151	130	109	130	272	52	326	5.7	152	63
16	113	186	149	144	114	130	292	36	309	6.2	176	59
17	115	181	147	156	109	128	342	78	335	5.7	312	52
18	105	186	145	151	109	134	373	151	245	6.3	219	44
19	116	183	144	151	115	155	320	193	194	6.8	219	47
20	101	181	142	151	117	143	261	107	238	6.5	292	80
21	112	181	139	148	120	128	244	81	238	79	238	99
22	116	179	138	146	118	129	294	236	104	94	212	115
23	110	177	136	144	113	136	158	285	65	72	216	172
24	109	169	133	143	113	140	47	298	30	53	188	144
25	114	168	131	132	112	132	49	126	8	49	151	107
26	99	172	132	131	103	126	9.3	96	8.2	33	139	93
27	62	169	132	133	100	130	14	154	9.3	31	93	98
28	76	171	132	134	98	124	14	286	5.6	34	76	69
29	80	171	132	132	---	122	264	494	5.3	52	84	76
30	171	168	131	129	---	130	290	412	6.5	47	70	80
31	287	---	130	129	---	164	---	335	---	144	46	---
TOTAL	3027	5992	4554	4188	3210	4063	6423.3	4778	11641.9	866.4	6622	2287
MEAN	97.6	200	147	135	115	131	214	154	388	27.9	214	76.2
AC-FT	6000	11890	9030	8310	6370	8060	12740	9480	23090	1720	13130	4540
MAX	287	274	168	156	127	164	468	494	1110	144	529	172
MIN	54	168	130	120	98	107	9.3	26	5.3	5.7	46	28

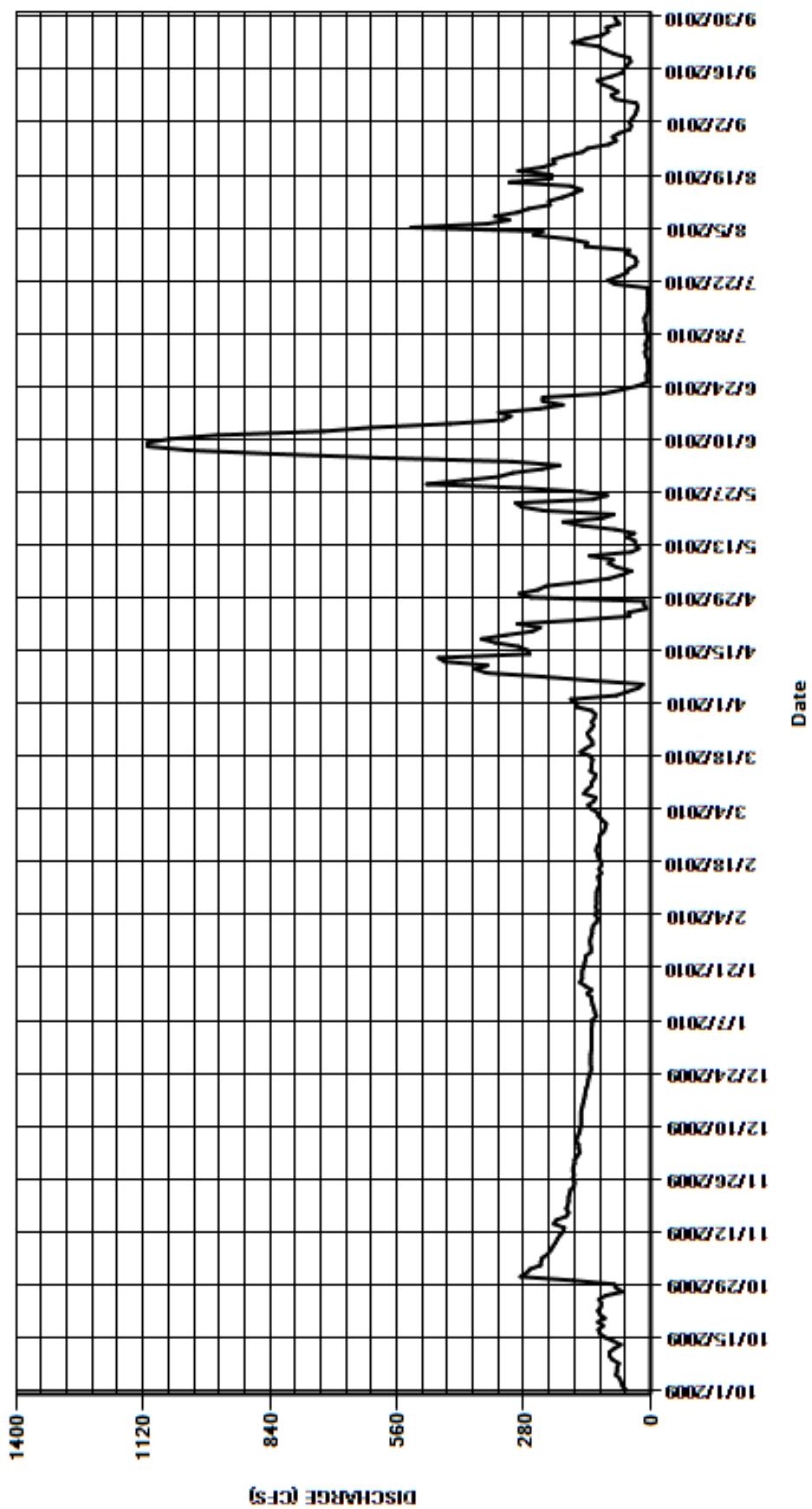
CAL YR	2009	TOTAL	65027.0	MEAN	178	MAX	1060	MIN	1.4	AC-FT	129000
WTR YR	2010	TOTAL	57652.6	MEAN	158	MAX	1110	MIN	5.3	AC-FT	114400

MAX DISCH: 1530 CFS AT 13:45 ON Jun. 09,2010 GH 6.16 FT. SHIFT -0.1 FT.

MAX GH: 6.16 FT. AT 13:45 ON Jun. 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER NEAR OLATHE
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
REDLANDS CANAL NEAR GRAND JUNCTION
Water Year 2010

Location.-- Lat. 39°01'49", Long. 108°33'51", in NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 35, T1S, R1W, Mesa County, on the right bank of canal 650 ft. below the Redlands diversion dam until Oct. 25, 2004. Beginning Apr. 1, 2005, Lat. 39°02'52.93", Long. 108°34'33.16", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec 27, T1S, R1W on the right bank just downstream of and attached to an old bridge.

Drainage and Period of Record.--

Equipment.-- A Sutron 9210 DCP with Modbus capabilities, Acoustic Doppler Velocity Meter (ADVM) in a cooperative agreement with the USBR and a Sutron Constant Flow Bubbler set to an outside staff gage. The Channel Master (CM) ADVM has the ability to give instantaneous flow readings. It produces the primary discharge record. A Sutron Satlink Logger 2 is controlled by the Sutron 9210 DCP and acts as the GOES radio transmitter. A radio attached to an antenna that has a direct line of sight (LOS) to the USBR programmable logic controller which enables control at the canal head gate. The LOS radio and Satlink Logger 2 are connected to the 9210 via a serial cables and communication ports. The Channel Master and AccuBubble are connected to the 9210 DCP via SDI-12 with a terminal block. The 9210 was disconnected about September 24, 2010 and the Satlink 2 started logging the data. The LOS radio was disconnected at that time as well. The following data is transmitted to the GOES satellite: GAGE_HT (CFB), DISCHRG2 (ADVM), and GAGE_HT2 [ADVM Vertical Beam (VB)]. The DWR web page reports DISCHARG which is calculated from a conventional rating table. This value is less accurate than the onsite flow data because there is no stage-discharge relationship. In absence of ADVM, discharge is estimated using the stage-discharge relationship from the bubbler.

Hydrologic Conditions.-- The Redlands Canal is a channel carved into the sandstone cliffs with a hard sedimentary bed rock bottom. The channel bottom is relatively flat with vertical walls along the side. Water in the canal is for power generation and irrigation. Penstock gates at the Redlands Water and Power Canal Company downstream of the gage control the flow in the canal and thus there is no unique stage-discharge relationship.

Gage-Height Record.-- ADVM COMPUTED RECORD: Discharge calculated from data provided by the ADVM was used from October 1, 2009 to September 30, 2010, except for August 5, 6, 17 and 21; September 17-24, 2010. The missing period was filled in with stage-discharge data from the CFB. The period from December 8-17 and December 29, 2009 – January 21, 2010 was ice affected in that the vertical beam registered low water levels, probably because the ice shelf at the edge above the CM contained sediment that showed a lower reflective surface.

Datum Corrections.-- Levels were not run during Water Year 2010. New bench marks were established and staff gages set at this site on Mar. 24, 2005. Levels were last run on March 24, 2006 by the USBR in cooperation with the development of the index velocity rating for the CM.

Rating.-- A. Conventional; the channel is very flat. The control is the reach of the canal along with the settings of the penstock gates and associated operation of the turbine. An electric probe controls the automatic head gate. There is an automatic control on the penstock gates too. The Redlands Canal is in essence a long fore bay. Rating No. 7 was used all year for the gage height portions. The new stage-discharge relationship for the gage was developed using ADCP measurements made on Apr. 1, 2005 and on Apr. 4, 2005. The USGS developed a stage-discharge relationship for comparison to their velocity index. Rating No. 7 is very similar to the USGS rating from 100 cfs to 1000 cfs; GH 2.10 to 7.80 ft. There were 6 measurements made during Water Year 2010 that were used for the conventional GH (stage-discharge) comparison. These were Nos. 314-319. Observations of zero flow were made on November 3, 2009 and Mar 23, 2010. The range of stage of the measurements and observation is from 0 to 7.40 ft.; the range of discharge of measurements and observations is from 0 to 965 cfs. The instantaneous peak flow was 992 cfs with a Vertical Beam reading of 7.49 ft. at 1000 hours on May 18, 2010. It exceeded the highest measured gage height of 7.40 (No. 319) by 0.09 ft. in stage and 27 cfs in discharge. The peak gage height was recorded by the Constant Flow Bubbler as 7.80 ft. on Aug 5, 2010. This exceeds the highest measured gage height of 7.40 ft. (No. 319) by 0.40 ft. of stage. The maximum vertical beam reading was at the same date and time and read 7.82 ft.; it exceeds the highest measured gage height by 0.42 ft. The 0.02 ft. difference in the two readings is acceptable due to separate locations on the right bank and turbulent conditions. These measurements and observations cover the entire range of flows recorded.

B. Index Velocity; The original index velocity was developed in water year 2006, from measurements 292-295, and loaded into the Channel Master ADVM. The index velocity is good from a range in stage of 6.00 ft to bank full stage somewhere above 7.82 ft. The original coefficient, 0.815, was in the Channel Master for the entire water year 2010. It was used for record purposes from 0000 on October 1, 2009 until the fall shut down on November 4, 2009. A new index velocity coefficient (0.877) was developed this water year from measurements 315, 317, 318, 319 and 320. A correction factor of 1.076 (0.877/0.815 = 1.076) was applied to the Channel Master data to correct the logged Channel Master values. The correction factor was applied from November 5, 2009 until the end of the water year.

Discharge.-- The Channel Master ADVM on site computed flow was used whenever it was available. This year's record has been developed from the computed flow from the ADVM. Stage-discharge values using the CFB and shifts derived from measurements were used to fill the missing periods.

Special Computations.-- A new index velocity was developed this water year from 5 different discharge measurements (no. 315, 317, 318, 319 and 320). The DCP was set to log raw discharge values every 5 minutes from the Channel Master. The raw 5 minute discharge values were generated from averaging discharge sampled over a 50 second period from the Channel Master. The average discharge from each measurement was divided by the raw average discharge from the Channel Master (collected over the same period) to develop an index velocity coefficient for each measurement. The index velocity coefficient for each measurement was averaged to develop the new index velocity (0.877). The index velocity coefficient programmed into the software of the Channel Master is 0.815. The reciprocal of the index velocity coefficient is 1.227. The values logged in the DCP from the Channel Master were multiplied by the reciprocal coefficient to develop a raw data set. The raw data set was multiplied by the new index velocity coefficient (0.877) to generate corrected discharge values. Essentially multiplying the hourly average discharge values from the Channel Master from the period of November 5, 2009 to the end of the water year by 1.076 (0.877/0.825) provides the same result. The ice period used the relation (difference) of the VB to the CFB. This was reduced to an approximate percentage. Then that decimal value of the percentage plus one ((X/100) +1) was multiplied by the CM Q value. This is really close to the actual flow. The velocity value is correct, the area component VB (Height) was reading low. $A \cdot V = Q$. $A = H \cdot W$. The range in which the difference occurred the sides are virtually vertical so the width component of Area didn't change. The CFB value corrected the Height component (factor) so with a corrected area then the flow (Q) is correct. The days in August when 16 or more unit values were too high a local correlation value comparing near and adjacent good values CM to CFB computed stage-discharge values were used to correct the CFB values. The days were Aug 5, 6, 17 and 21. The comparison days were Aug 1, 3, 7 and 8. The correction factor used was 1.019 or about +2%. The spurious values have been seen before, and are probably caused by heavy clay / silt laden colloidal suspension mixture / suspension. The period Sep 17-24, when the CM locked up, a percentage of CM to CFB was run as a series from the leading to the following good values. Weight was given to the hourly adjacent good values on the 17th as a percent added to the daily missing values assigned to the series percentage multiplied by the CFB adjusted value then the remaining days were assigned the adjusted daily values, using the adjusted, computed stage-discharge values derived from the gage height from the CFB. The correlation factors ran from 0.964 to 0.834 so the series smoothed the much higher stage-discharge values. The decision to select measurements for the index velocity which were at an operational flow was done because the canal is generally either fully on or off. The shoulder days in which the flow is going down or coming on is low, and these aren't full days either. This year the canal was fully off for four days and there were four shoulder days. The shoulder days are 1.1% of the year. The fully off days are 1.1% of the total year. That leaves 98.9% of the flow running at an operational level for the days that the canal is on. This would be a higher value if total hours were used.

Remarks.-- The record is rated good when the ADVM was used from October 1, 2009 through September 30, 2010 except during two ice periods from Dec 8-17 and Dec 29, 2009 - Jan 21, 2010; four days in August 5, 6, 17 and 21 when spurious values were seen; and from Sep 17- 24 when the ADVM locked up. The two ice periods are rated fair and the four days in Aug and eight days in Sept are rated poor. Station maintained and record developed by Gerald M. Thrush .

Recommendations.-- The data needs to be downloaded on a more frequent schedule because the number of logged parameters has increased and they are being logged on a 5 minute interval.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

REDLANDS CANAL NEAR GRAND JUNCTION

RATING TABLE--

STCONVERT USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	837	805	849	781	762	794	879	877	929	916	949	906
2	841	326	862	757	764	796	884	882	930	916	949	898
3	835	0	874	758	764	796	855	885	939	920	944	901
4	824	0	860	769	763	800	856	873	937	918	926	906
5	827	418	821	785	764	819	866	897	941	915	954	909
6	838	859	839	800	765	834	869	907	940	908	910	912
7	841	858	830	810	767	829	880	919	928	890	891	905
8	841	853	855	780	768	844	879	906	935	882	902	914
9	830	852	776	757	762	845	856	902	930	886	928	947
10	826	852	742	758	760	830	803	910	916	894	927	931
11	822	851	728	710	766	844	866	896	921	893	930	934
12	830	866	748	694	766	850	838	894	918	906	929	936
13	837	865	794	693	766	850	845	905	924	903	930	940
14	842	871	799	709	766	865	846	932	907	896	913	935
15	849	889	822	691	765	867	853	946	915	880	911	926
16	856	884	912	711	763	860	878	928	931	871	909	929
17	854	876	810	727	764	858	873	912	935	868	912	927
18	852	870	800	724	762	866	869	895	934	868	930	900
19	829	870	804	755	766	866	862	919	941	873	916	884
20	814	872	799	752	775	874	865	919	949	881	933	873
21	821	870	803	738	775	605	882	912	959	865	934	859
22	823	869	811	770	764	0	886	912	949	929	918	846
23	826	868	809	775	762	0	870	911	947	924	926	842
24	823	864	763	766	770	383	851	928	940	911	932	820
25	786	854	773	763	787	857	856	930	943	904	923	800
26	775	849	772	756	791	858	869	928	946	896	918	798
27	823	855	752	758	790	861	881	938	948	888	911	801
28	823	856	752	765	788	859	878	945	946	897	908	802
29	823	856	777	766	---	856	897	932	931	931	925	800
30	822	855	796	766	---	849	889	934	926	918	926	884
31	799	---	798	763	---	855	---	937	---	922	919	---
TOTAL	25669	23133.00	24930	23307	21525	23770.00	25981	28311	28035	27869	28633	26565
MEAN	828	771	804	752	769	767	866	913	934	899	924	886
AC-FT	50910	45880	49450	46230	42690	47150	51530	56150	55610	55280	56790	52690
MAX	856	889	912	810	791	874	897	946	959	931	954	947
MIN	775	0	728	691	760	0	803	873	907	865	891	798

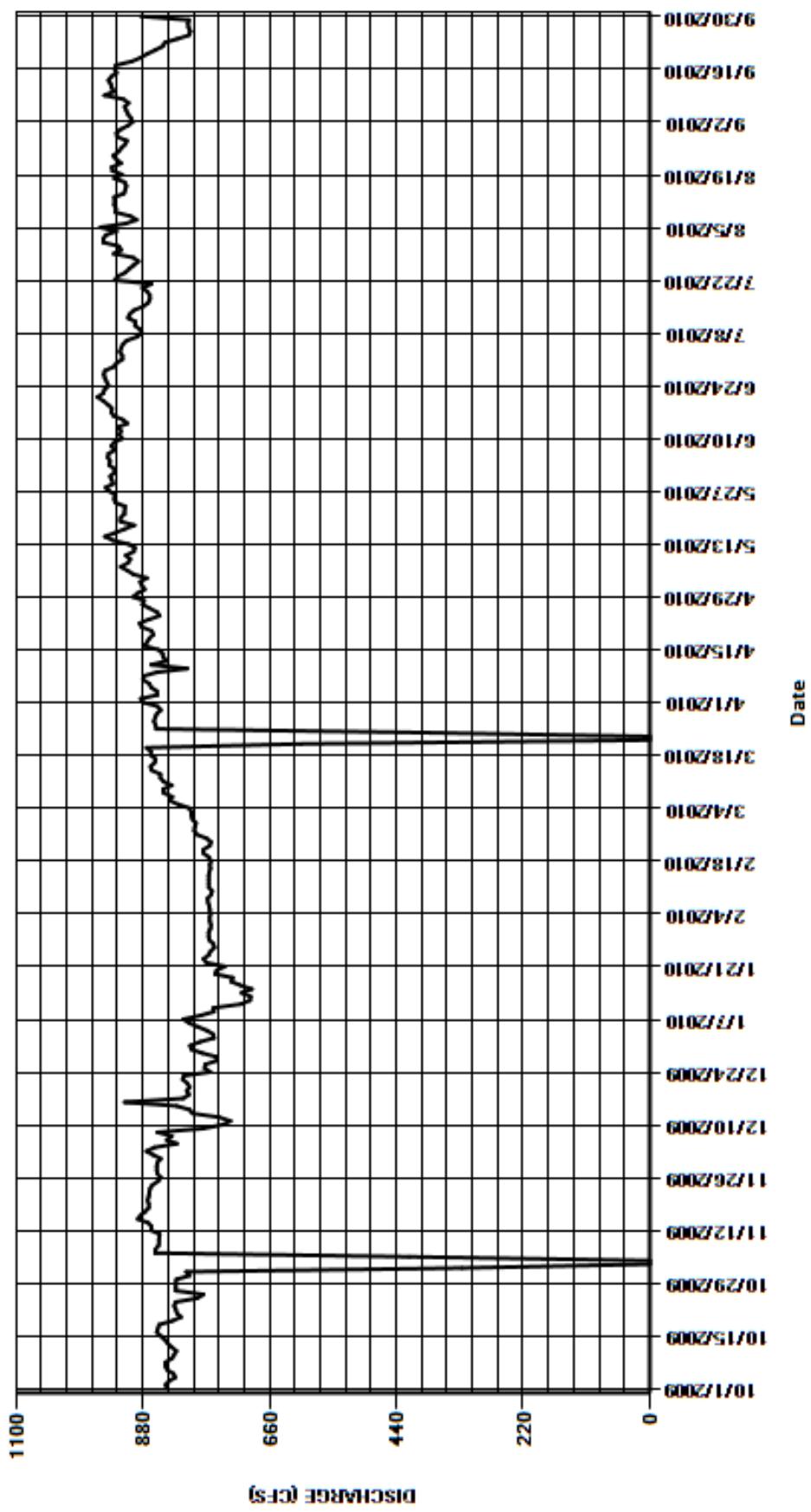
CAL YR	2009	TOTAL	257443.00	MEAN	705	MAX	912	MIN	0	AC-FT	510600
WTR YR	2010	TOTAL	307728.00	MEAN	843	MAX	959	MIN	0	AC-FT	610400

MAX DISCH: 992 CFS AT 10:00 ON May. 18,2010

MAX GH: 7.8 FT. AT 06:00 ON Aug. 05,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

REDLANDS CANAL NEAR GRAND JUNCTION
WY2010 HYDROGRAPH



GUNNISON RIVER BASIN
GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
Water Year 2010

Location.--	Lat. 39°02'17", Long. 108°34'13", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec 26, T.1 S., R.1 W., Mesa County, on the right bank of the Gunnison River just up stream of the Department of Energy Compound, about 1.6 miles above the mouth and the Colorado River, and about 0.78 miles below the Redlands Canal Diversion Dam.
Drainage and Period of Record.--	
Equipment.--	A Sutron Satlink I Logger high data rate DCP and a Sutron Constant Flow Bubbler (CFB). The DCP was replaced by a Sutron Sat Link 2 on Dec. 17, 2009 when an air temperature sensor was installed. The shelter is a 48-inch CMP culvert on a concrete pad. The primary reference is an outside cantilever chain gage which can be used at low gage readings if the bank is trenched. It is used up to gage height 13.00 ft. The secondary reference gage is a section of staff gage that is carried to and placed at the top of the brass nut at the end of the orifice line. Gage height of the brass nut is 0.46 ft. This is used to calibrate the CFB at extremely low flows and is more accurate under these circumstances than the cantilever because the cantilever is 60+ ft. downstream. No other changes this water year.
Hydrologic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter except for the coldest times in the year and this is not as apparent especially during higher flows around 1000 cfs. The Redlands Canal Diversion Dam is 0.78 miles upstream and diverts water in the range of 700 to 800 cfs all year for power generation, and during irrigation season it diverts an additional 60 cfs. Reservoirs up stream include Taylor Park Reservoir, Blue Mesa Reservoir, Morrow Point Reservoir, Crystal Reservoir and Ridgway Reservoir. The higher discharges probably starting around 5,000 cfs and flood flows around the range of 18,000 cfs will obviously experience back water from the Colorado River.
Gage-Height Record.--	The primary record is hourly averages of 15-minute bubbler data from satellite telemetry with DCP download data used for backup purposes. The record is complete and reliable except for the following days when ice affected the stage discharge relationship: Dec. 9-17, 26-31, 2009, Jan. 1-18, 2010; and when the bubbler gave incorrect readings: Apr. 29-May 1, 2010. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The bubbler was adjusted on 7 separate occasions this water year. The sensor corrections ranged from -0.04 to +0.04 ft. All corrections made were prorated by time back to the last known matching readings. No flush corrections were made this water year.
Datum Corrections.--	Levels were run on Mar 25, 2010 and a datum correction of -0.28 ft. was made based on BM No. 2. Levels were last run in 2002.
Rating.--	The control is the natural streambed with a somewhat stable cobble channel. At high flows in the range of 18,000 cfs and above, backwater from the Colorado River affects the control. Rating GUNREDCO04 in use since October 1, 2004, was used the entire Water Year. Nine discharge measurements (Nos. 128-136) were made during WY2010, ranging in discharge from 339 cfs to 4660 cfs. Measurements cover the range experienced, except the lower mean daily flows on November 25-December 1, 2009, February 23-25, 27, 28, March 13, 26 - 30, Jul 16-19, 21, 2010; and the higher mean daily flows on Apr 22-23, May 17-23, 2010. The peak instantaneous flow of 6490 cfs occurred at 2045 May 18, 2010 at a gage height of 6.79 ft with a shift of -0.07 ft. It exceeded measurement No. 132, made May 17, 2010 by 1.22 feet in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by time from 0000 October 1, 2009 to 1645 Mar 25, 2010 (Measurement no. 131 just before the datum correction was made). During the remainder of the water year a variable stage-shift relationship: GUNREDCO10VSA, was applied through the high flow period to the end of the water year (1700 Mar 25, 2010 to 2345 Sep 30, 2010). Open water discharge measurements demonstrated shifts ranging from -0.07 to +0.34 ft. All of these were given full weight and applied directly except Nos. 128, 130, and 133, which were discounted -2 to +3% to smooth shift distribution. Measurement 129 was not used.
Special Computations.--	The ice effect this year was mostly anchor ice. During the lower flows and cold temperatures the river was frozen over well below the gage. The ice periods were estimated using adjacent good record days, a graph of 15 min. data and from temperatures taken at the gage. These values were compared to the flows seen at the Gunnison River nr. Grand Junction and the Redlands Canal and then further refined. During the period when there were sensor problems, the gage height was estimated graphically using trends in the gage height plots on the monthly chart and making appropriate corrections during drastic spikes. Then if these corrections were more than sixteen unit values for the day, they were considered missing gage height record. All of these were greater than 5% than the raw values.
Remarks.--	The record is rated as good except when the stage-discharge relationship was affected by ice, and when the CFB malfunctioned, which were estimated and are considered poor; and when the flow exceeded 5820 cfs: May 18-19, 2010, which is rated fair. Station maintained and record developed by Gerald M. Thrush.
Recommendations.--	A few higher measurements would extend the upper end of the rating curve. These are difficult because the high water measurements have to be made from a boat owned and operated by the Bureau of Reclamation. Scheduling difficulties leads to missing high water opportunities. Then a better projection could be made with more high water measurements at the high end of the curve. The use of ADCP measurements will allow more frequent high water measurements in that a cable does not have to be strung across the river to stabilize the boat for a conventional measurement. Levels need to be verified.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM

RATING TABLE--

GUNREDSCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

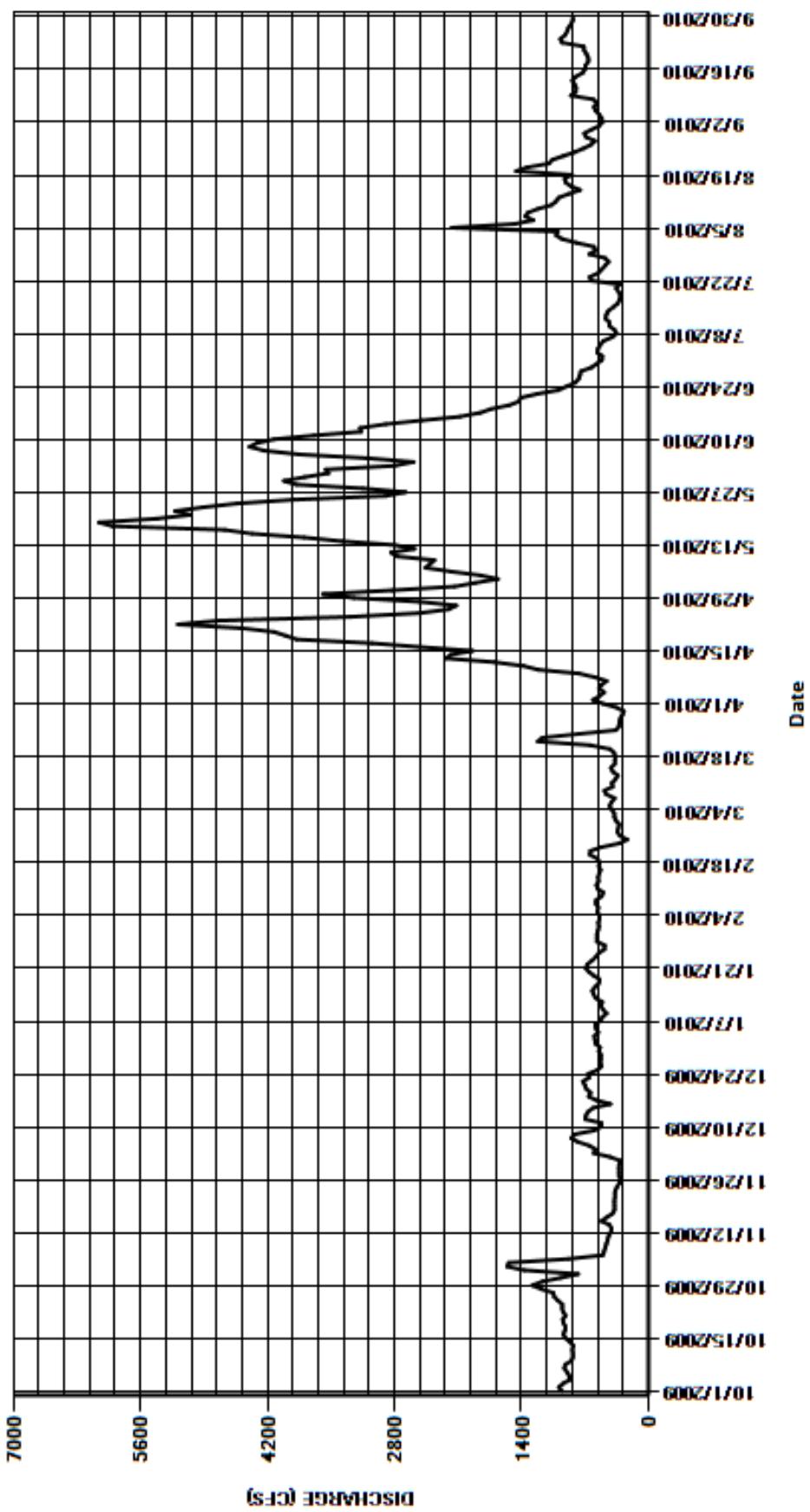
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	953	776	310	585	547	358	501	2830	3530	514	793	543
2	989	1370	424	590	553	377	613	2140	3560	510	951	508
3	943	1560	604	598	542	379	543	1910	2800	567	1020	515
4	867	1540	585	554	544	408	489	1660	2590	557	1000	546
5	874	884	653	580	564	430	547	1860	3100	533	2170	583
6	899	504	781	585	553	405	519	2180	3850	500	1480	601
7	928	490	853	532	580	374	461	2460	4240	402	1270	565
8	920	478	812	510	577	467	593	2410	4400	353	1360	610
9	850	465	600	462	517	486	770	2360	4320	376	1330	856
10	835	450	520	502	499	395	1220	2770	4130	432	1220	803
11	836	442	520	526	561	404	1380	2840	3690	433	1070	798
12	840	416	700	510	574	364	1700	2580	3170	475	1020	816
13	829	408	690	580	550	338	2230	2800	3180	465	989	841
14	865	429	665	604	557	394	2180	3380	2900	443	877	803
15	914	520	610	620	545	415	1940	3800	2500	388	754	726
16	939	462	420	590	530	374	2520	4370	2080	338	855	702
17	923	397	575	548	549	371	3050	4670	1860	320	913	694
18	913	375	660	540	539	366	3880	5910	1740	308	926	664
19	937	374	638	603	562	380	4000	6060	1540	329	844	666
20	945	377	686	658	645	426	4130	5420	1430	358	1460	684
21	913	373	702	691	642	642	4490	5050	1410	316	1340	710
22	943	370	723	674	521	1220	5190	5220	1230	636	1100	714
23	953	368	655	623	324	1170	4730	4910	997	647	1060	953
24	951	349	666	579	234	766	3290	4540	904	554	940	972
25	1000	323	562	548	313	359	2520	3920	808	515	815	921
26	1040	308	520	485	343	325	2200	2900	770	478	718	898
27	1050	326	530	483	334	322	2120	2680	756	439	635	883
28	1180	326	525	569	323	312	2530	3150	745	479	591	853
29	1280	328	525	568	---	289	3250	3880	630	653	688	833
30	1170	325	548	568	---	272	3590	4020	570	584	708	831
31	968	---	535	558	---	353	---	3790	---	603	629	---
TOTAL	29447	16113	18797	17623	14122	13941	67176	108470	69430	14505	31526	22092
MEAN	950	537	606	568	504	450	2239	3499	2314	468	1017	736
AC-FT	58410	31960	37280	34960	28010	27650	133200	215200	137700	28770	62530	43820
MAX	1280	1560	853	691	645	1220	5190	6060	4400	653	2170	972
MIN	829	308	310	462	234	272	461	1660	570	308	591	508
CAL YR	2009	TOTAL	697578	MEAN	1911	MAX	10000	MIN	308	AC-FT	1384000	
WTR YR	2010	TOTAL	423242	MEAN	1160	MAX	6060	MIN	234	AC-FT	839500	

MAX DISCH: 6490 CFS AT 20:45 ON May. 18,2010 GH 6.79 FT. SHIFT -0.07 FT.

MAX GH: 6.79 FT. AT 20:45 ON May. 18,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
WY2010 HYDROGRAPH



BLUE RIVER BASIN
BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE
Water Year 2010

Location.--	Lat. 39°32'29", Long. 106°02'40", in SE 1/4 SW 1/4 sec. 7, T.6 S., R.77 W., Hydrologic Unit 14010004, Summit County, on right bank 25 ft. above Highway 9 Bridge, 3 1/2 miles north of Breckenridge and 2 1/4 miles south of Dillon Reservoir(Blue River Arm).
Drainage and Period of Record.--	N/A
Equipment.--	Sutron Model 56-0540 shaft encoder (SE) and Sutron SatLink2 data collection platform (DCP) installed in a precast concrete shelter. A Stevens A-71 graphic water-stage recorder is used as a backup. Well is connected to stream by two 2-in intake pipes which are flushed with outside risers. Graphic recorder and shaft encoder have separate floats and are set by drop-tape to an adjustable inside reference point. Station has AC power that allows use of a stock tank heater and space heater to prevent well and intakes from freezing during winter.
Hydrologic Conditions.--	Transmountain diversions above the station occur through the Continental-Hoosier Tunnel and the Boreas Pass Ditch.
Gage-Height Record.--	The primary record is hourly averages of 15 minute satellite data. Chart record is used for backup. The record is complete and reliable, except as follows. Loss of AC power resulted in a frozen well and period of bad gage height data on Dec. 14-15, 2009. Plugged intakes resulted in a period of no gage height data from Jun. 10 to Jul. 19, 2010. Flush corrections were applied to correct gage height data during three periods beginning Jul. 20 and ending Aug. 18. Instrument corrections were applied throughout the water year.
Datum Corrections.--	Levels were run on Aug. 18, 2010 using RM 1 as base. The gage was found to read correct and no corrections were made to the inside R.P.
Rating.--	Low water control is rock and cobble riffle at the gage house. High water control is three 8'0" culverts 25 ft below gage house under Highway 9. Channel is often mossy during the winter. Rating No. 10 (developed Nov. 16, 2009) was used from Oct. 1, 2009 through Jun. 10, 2010. Rating No. 11 (developed Nov. 16, 2010 using measurements 134-138) was used for remainder of Water Year 2010. Nine discharge measurements (Nos. 129-137) were made during the water year. Measurement 138 made subsequently, was also used for analysis. The measurements ranged from 13.1 to 421 cfs, which covers the range of discharge experienced except for the lower daily flows of Feb. 3, 11, 26, and Mar. 10-15. The peak discharge of 402 cfs was estimated and occurred on June 9, 2010 during a period of estimated gage height due to plugged well intakes.
Discharge.--	Shifts were distributed by time from the beginning of Water Year 2010 through Mar 29, 2010. Variable shift curve BLUNINCOSC1 was used from Mar 29 through the peak flow (Jun 10). Shifts were again distributed by time through the end of Water Year 2010. Measurements made this year indicate raw shifts ranging from -0.03 ft (Rating 11) to +0.21 ft (Rating 10). Measurements 135-137 were discounted from -8% to +14% to smooth the shift distribution.
Special Computations.--	Discharge during period of frozen well on Dec. 14-15 was estimated using adjacent good gage height data. Daily discharge data during period of no gage height from Jun. 8 to Jul. 19 was estimated by hydrographic comparison with downstream gage, Blue River near Dillon (BLUNDICO) operated by USGS. Flush corrections were developed by comparing resulting daily discharge data with measured daily discharge data from BLUNINCO gage.
Remarks.--	Record is rated as good except for estimated periods which are considered poor. Station was maintained and record developed by Craig Bruner.
Recommendations.--	Lower gage datum to remove negative gage height range in rating. Install constant flow bubbler (CFB) with orifice in stream to circumvent problem of clogged intakes and to replace graphic recorder as backup record. After installation, assess potential to use CFB data as primary record and SE data as backup record. Make more gage visits and more measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE

RATING TABLE--

BLUNINCO10 USED FROM 01-Oct-2009 TO 10-Jun-2010
BLUNINCO11 USED FROM 10-Jun-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

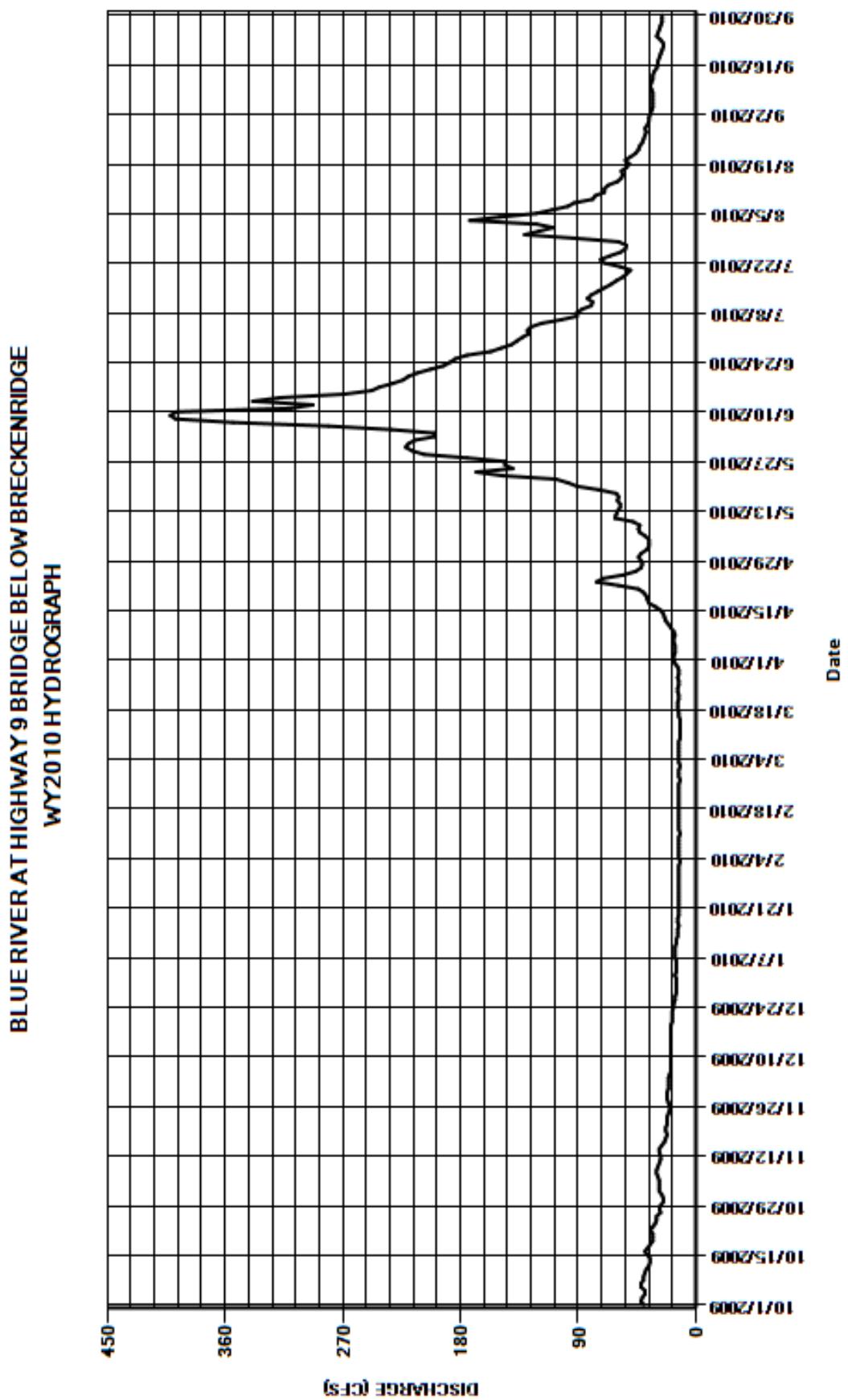
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	26	21	15	13	13	17	42	220	133	109	36
2	42	28	21	16	13	12	17	38	215	128	122	35
3	41	28	21	15	12	13	16	36	200	129	173	34
4	39	28	21	15	13	13	16	36	200	126	150	33
5	39	28	20	15	13	13	16	36	233	118	122	33
6	42	29	19	15	13	13	17	39	281	103	110	33
7	42	30	19	16	13	13	17	43	354	91	98	33
8	40	30	19	16	13	13	16	44	398	91	93	33
9	40	29	19	16	13	13	17	43	402	87	79	34
10	39	28	19	16	13	12	19	48	397	80	77	35
11	38	27	19	15	12	12	21	62	310	79	70	34
12	36	27	19	15	13	12	23	61	293	83	70	33
13	35	28	19	14	13	12	24	60	339	80	67	33
14	35	28	19	14	13	12	25	58	318	75	60	32
15	37	26	19	14	13	12	27	58	269	70	57	30
16	39	24	19	13	13	13	31	60	248	65	56	29
17	37	23	19	14	13	13	36	59	242	61	57	29
18	35	22	19	14	13	14	37	61	232	56	53	28
19	33	23	19	13	13	14	38	74	224	53	51	27
20	33	23	18	13	13	14	40	91	220	50	54	26
21	33	22	18	13	13	13	44	98	213	58	50	25
22	35	22	18	13	13	13	59	107	203	70	46	25
23	33	22	18	13	13	14	76	148	193	73	44	27
24	31	21	17	13	13	14	71	168	188	66	43	30
25	30	20	17	13	13	13	55	140	184	58	41	29
26	30	20	16	13	12	13	46	146	175	54	40	28
27	27	21	16	13	13	14	42	146	157	53	39	27
28	28	22	15	13	13	13	41	175	149	59	38	26
29	27	22	15	13	---	13	42	208	141	92	39	26
30	25	22	15	13	---	14	44	217	137	131	37	26
31	25	---	15	13	---	16	---	222	---	120	36	---
TOTAL	1086	749	568	437	361	406	990	2824	7335	2592	2181	909
MEAN	35	25	18.3	14.1	12.9	13.1	33	91.1	244	83.6	70.4	30.3
AC-FT	2150	1490	1130	867	716	805	1960	5600	14550	5140	4330	1800
MAX	42	30	21	16	13	16	76	222	402	133	173	36
MIN	25	20	15	13	12	12	16	36	137	50	36	25
CAL YR	2009	TOTAL	25657	MEAN	70.3	MAX	361	MIN	15	AC-FT	50890	
WTR YR	2010	TOTAL	20438	MEAN	56	MAX	402	MIN	12	AC-FT	40540	

MAX DISCH: 402 CFS (ESTIMATED TO OCCUR ON JUNE 9, 2010)

MAX GH: FT. (OCCURRED DURING PERIOD OF ESTIMATED GAGE HT)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



BLUE RIVER BASIN
SNAKE RIVER AT KEYSTONE SKI AREA
Water Year 2010

Location.--	Lat 39°36'24", long 105°57'06", in NE1/4 NE1/4 Sec. 24, T5S, R77W in Summit County. Located on left bank just below Keystone Ski Area snowmaking diversion, 0.5 mi below confluence with North Fork of Snake River, 1.5 mi above confluence with Keystone Gulch, and 3.2 mi upstream of Snake River Arm of Dillon Reservoir.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron constant flow bubbler (CFB) sensor and Sutron SatLink data collection platform (DCP) are housed in the Keystone Ski Area snowmaking diversion/pump building. The CFB is calibrated to a staff gage located above rock weir control and below Keystone diversion dam.
Hydrologic Conditions.--	Drainage basin is the main stem of the Snake River. Record includes bypass water (pumped from Montezuma shaft of Roberts Tunnel) that is not diverted for snowmaking. Banks between the dam and control are steep and velocity is generally slow in this reach. Channel below the control is composed of cobble and is relatively straight to the measurement section. There is one channel at all stages.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite-transmitted data. The record is complete and reliable for the six month period of operation (Oct 1, 2009 – Mar 31, 2010) except for Dec 10-11, 2009, when the CFB gage height readings were erratic. Three instrument calibration corrections were made to the CFB sensor during the period of record.
Datum Corrections.--	Levels were run on Sep 29, 2009. Using RM 1 as a base the staff gage was determined to be set 0.03 ft low, resulting in gage height readings that were 0.03 ft high. The staff gage elevation was corrected in the field prior to the period of record.
Rating.--	Control is a W-weir rock structure approximately 100 ft downstream of the Keystone snowmaking diversion point and 20 ft downstream of AccuBubble orifice pipe. Rating No. 12 was used for all of Water Year 2010. Five measurements (26–30), were used for analysis. Measurements range in discharge from 11.2 to 27.8 cfs, which covered the range of flows experienced during the period of record except for lower daily flows of Dec 3-4, 19, 25; Jan 7, 12, 15, 19, 24-25, 28-30; Feb 3, 5, 8, 10-27; and Mar 1-6, 8-29 and higher daily flows of Nov 6-8, 11. The peak discharge of 43.2 cfs occurred at 2245 on Nov 5, 2009 at a gage height of 2.15 ft with a shift of +0.02 ft. The peak gage height exceeded high measurement 26 by 0.13 ft in stage.
Discharge.--	A shifting control method was used for WY2010. It is not clear why shifts for measurements 26 and 27 exhibited shifts significantly closer to zero, as compared to subsequent measurements. Levels run subsequent to the period of record did not indicate that the staff gage was reading low, which would result in more positive shifts. Accordingly, measurements 26 and 27 were not discounted and shifts were distributed by time from Oct 1 - Dec 15, 2009. Variable stage-shift curve SNAKEYCOVS10 was defined by measurements 28-30 and applied from Dec 15, 2009 through Mar 31, 2010. Raw shifts ranged from 0.00 to +0.08 ft. Measurements 29 and 30 were not given full weight and were discounted from -3% and +6 % respectively to develop SNAKEYCOVS10.
Special Computations.--	Discharges during period of bad gage height on Dec 10-11, 2009 were estimated by comparison with adjacent good gage height data and calculated discharges.
Remarks.--	Record is rated as good except for days of estimated daily discharge which are considered as fair. Station operated and record developed by Craig Bruner.
Recommendations.--	Develop new rating based on measurements from water years 2007 – 2010.. Consider construction of a cantilever chain gage to replace staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SNAKE RIVER AT KEYSTONE SKI AREA

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

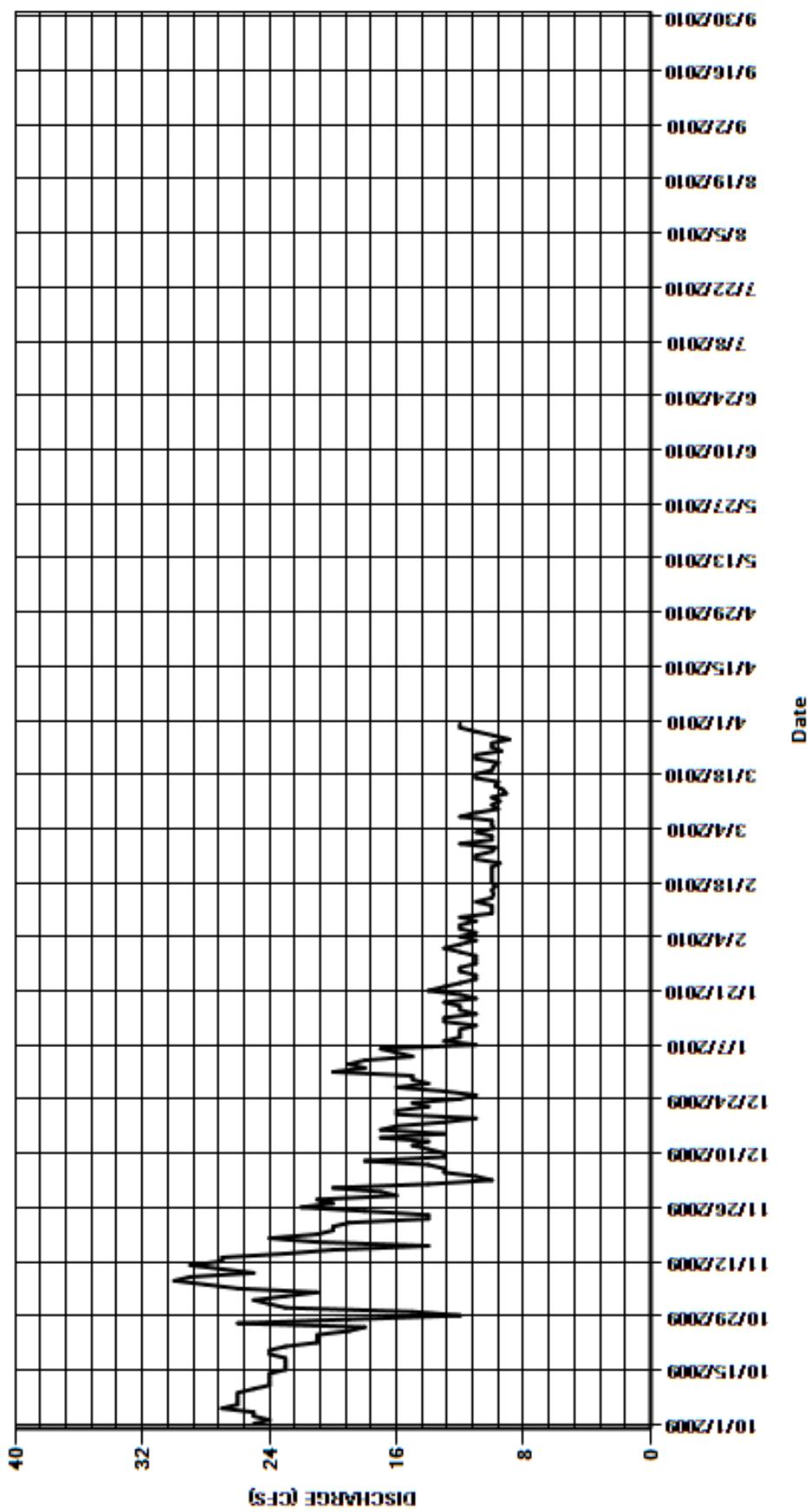
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	24	20	18	13	10	---	---	---	---	---	---
2	24	25	14	19	12	10	---	---	---	---	---	---
3	25	23	10	18	11	11	---	---	---	---	---	---
4	25	21	11	15	12	9.9	---	---	---	---	---	---
5	27	26	13	16	11	10	---	---	---	---	---	---
6	26	28	13	17	12	10	---	---	---	---	---	---
7	26	30	14	11	12	12	---	---	---	---	---	---
8	26	29	18	13	11	11	---	---	---	---	---	---
9	26	25	13	12	12	9.6	---	---	---	---	---	---
10	25	27	13	12	10	10	---	---	---	---	---	---
11	24	29	14	12	10	9.5	---	---	---	---	---	---
12	24	27	15	11	10	10	---	---	---	---	---	---
13	24	27	14	13	11	9.1	---	---	---	---	---	---
14	24	23	17	13	10	9.3	---	---	---	---	---	---
15	23	20	13	11	9.9	9.8	---	---	---	---	---	---
16	23	14	17	12	10	9.6	---	---	---	---	---	---
17	23	21	16	12	9.8	11	---	---	---	---	---	---
18	23	24	13	13	10	11	---	---	---	---	---	---
19	24	21	11	11	10	10	---	---	---	---	---	---
20	24	20	16	12	10	9.9	---	---	---	---	---	---
21	23	20	16	14	10	9.6	---	---	---	---	---	---
22	21	19	14	13	10	11	---	---	---	---	---	---
23	21	14	15	12	9.5	11	---	---	---	---	---	---
24	21	14	12	11	11	9.4	---	---	---	---	---	---
25	19	18	11	11	11	10	---	---	---	---	---	---
26	18	22	13	12	10	10	---	---	---	---	---	---
27	26	20	16	12	9.8	8.9	---	---	---	---	---	---
28	19	21	14	11	12	9.9	---	---	---	---	---	---
29	12	16	15	11	---	11	---	---	---	---	---	---
30	15	17	15	11	---	12	---	---	---	---	---	---
31	23	---	20	12	---	12	---	---	---	---	---	---
TOTAL	709	665	446	401	300.0	317.5	---	---	---	---	---	---
MEAN	22.9	22.2	14.4	12.9	10.7	10.2	---	---	---	---	---	---
AC-FT	1410	1320	885	795	595	630	---	---	---	---	---	---
MAX	27	30	20	19	13	12	---	---	---	---	---	---
MIN	12	14	10	11	9.5	8.9	---	---	---	---	---	---
CAL YR	2009	TOTAL	2938	MEAN	16.1	MAX	30	MIN	10	AC-FT	5830	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	2838.5	MEAN	15.6	MAX	30	MIN	8.9	AC-FT	5630	(PARTIAL YEAR RECORD)

MAX DISCH: 43.2 CFS AT 22:45 ON Nov. 05,2009 GH 2.15 FT. SHIFT 0.02 FT.
MAX GH: 2.15 FT. AT 22:45 ON Nov. 05,2009

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SNAKE RIVER AT KEYSTONE SKI AREA
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
Water Year 2010

Location.-- Lat. 39°13'30", Long. 106°51'20", NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.9 S., R.85 W., Pitkin County, on left bank at Aspen Consolidated Sanitation Plant 0.5 mi east of Aspen Airport and 0.8 mi downstream from confluence of Maroon Creek.

Drainage and Period of Record.-- N/A

Equipment.-- Graphic water-stage recorder and Sutron Model 56-0540 shaft encoder (SE) and Sutron SatLink2 data collection platform (DCP) housed in precast concrete building with a 12.5 ft deep well. Stilling well is connected to stream by two 2-in diameter intake pipes with outside riser pipes for flushing. Graphic recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape.

Hydrologic Conditions.-- Upstream transmountain diversions occur through Hunter Tunnel (part of Fryingpan-Arkansas system) and Twin Lakes Tunnel. Building is equipped with AC power that allows use of a space heater and a stock tank heater. Well and intakes do not freeze. Anchor ice forms in the control during very cold weather and causes a backwater effect.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with chart data used for backup. The record is complete and reliable, except for Dec 4-5, 9-14, 19-21, 25-29, 31, 2009, Jan 1, 4-5, 8-16, 2010, when the stage-discharge relationship was affected by anchor ice in the natural control. Several instrument corrections were applied during the period of record. The intakes were buried by cobbles and boulders from about Jun 8 until Aug 11 when they were uncovered using a trackhoe. During this period, the intakes could not be flushed, but gage heights appeared to be reasonably accurate. No flush corrections were applied in Water Year 2010.

Datum Corrections.-- Levels were run to inside gage on Oct 6, 2008. Using RM 2 as a base, the gage was found to read correct and the R.P. was not adjusted.

Rating.-- Channel is composed of cobble throughout and is straight from 400 ft above to 100 ft below the gage. Banks are steep on right bank and medium on left bank. The low flow control is a rock and cobble riffle about 80 ft below the gage. High flow control is 15 ft diameter boulder about 100 ft downstream of gage. During rising high flows of Jun 4-8, cobbles and boulders were deposited in the control and channel cross-section. This significantly changed hydrologic conditions in the reach of the river adjacent to the gage and invalidated Rating 5, which was used from Oct 1, 2009 until the peak gage height on Jun 8, 2010. Rating 6 (developed Jan 3, 2011) was applied from the peak gage height on Jun 8 through the end of WY 2010. Twelve measurements (Nos. 201-212) were made during Water Year 2010. Measurement 213 made subsequently was also used for analysis. Measurements ranged from 84.1 to 2700 cfs, which covered the range experienced during the year except for the lower daily flows on Jan 8-10 and the higher daily flows of Jun 8. The peak discharge of 3350 cfs occurred at 0315 on Jun 8, 2010 at a gage height of 6.75 ft with a shift of 0.00 ft. The peak gage height exceeded high measurement 207 by 0.39 ft in stage.

Discharge.-- Shifting control method used for Water Year 2010. Shifts were distributed by time for the entire period of record. Discharge measurements made this water year indicated raw shifts ranging from -0.07 to +0.12 ft. Measurements 201-206 and 208-210 were discounted -5% to +5% to smooth shift distribution.

Special Computations.-- Discharge estimates for ice-affected days were based on adjacent days with good chart record. As a general check on the discharge record at this gage, a hydrographic comparison was made to upstream gage on the Roaring Fork river near Aspen (ROAASPCO operated by USGS). The analysis revealed that flow trends at the two gages were reasonably consistent during WY 2010.

Remarks.-- Record is good except during periods of ice-affected control when record is rated as fair. Gage operated and maintained by Craig Bruner and record developed by James Kellogg.

Recommendations.-- Cableway is due for inspection.

STATE OF COLORADO
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ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN

RATING TABLE--

ROABMCC05 USED FROM 01-Oct-2009 TO 08-Jun-2010
ROABMCC06 USED FROM 08-Jun-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

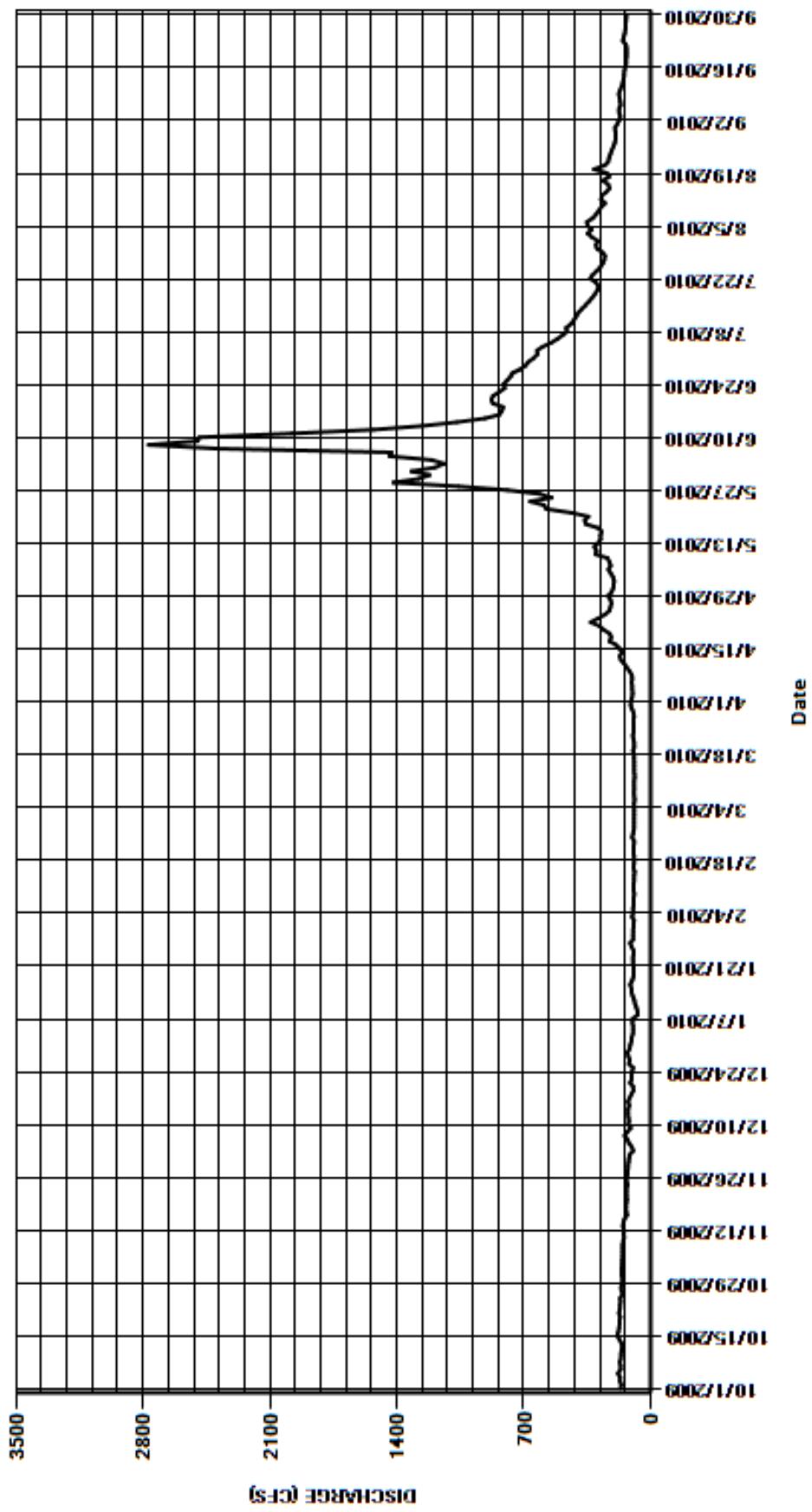
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	167	160	119	106	95	92	109	207	1320	645	291	184
2	162	160	115	104	92	91	103	204	1190	625	323	174
3	170	158	96	98	102	91	100	202	1140	627	348	167
4	169	157	104	97	97	91	101	208	1210	596	326	174
5	180	156	120	97	97	92	101	221	1440	550	347	174
6	166	156	128	101	95	89	105	233	1430	516	353	166
7	166	155	144	99	94	91	102	221	2390	487	321	168
8	170	155	129	71	94	93	104	228	2770	462	302	172
9	165	152	110	73	90	90	116	238	2500	466	287	176
10	164	147	123	79	95	91	132	304	2490	440	273	168
11	161	149	120	87	96	91	145	299	1980	424	252	160
12	157	147	123	91	93	89	164	311	1530	411	274	153
13	161	153	125	99	92	90	171	289	1260	399	270	149
14	173	150	125	106	91	90	157	276	1070	380	244	147
15	184	144	118	106	89	90	171	278	915	359	227	145
16	178	130	125	113	95	90	191	270	834	340	234	141
17	174	135	116	103	92	92	228	290	821	322	264	135
18	172	135	106	96	91	93	217	357	814	307	229	135
19	172	134	95	95	92	97	226	364	871	294	242	133
20	168	131	97	94	94	90	259	343	879	287	312	132
21	175	132	113	95	94	91	282	436	869	302	255	133
22	170	133	104	97	93	95	331	575	836	333	234	136
23	169	133	105	98	91	98	289	588	805	321	230	154
24	167	126	102	95	102	94	254	665	812	299	222	149
25	168	133	97	94	97	93	229	546	794	279	214	143
26	154	131	120	105	93	94	222	612	774	265	206	140
27	162	126	115	113	92	96	216	790	763	256	198	138
28	163	126	123	96	92	92	222	1060	720	252	193	137
29	157	125	128	97	---	94	235	1420	690	266	193	135
30	156	122	116	96	---	103	215	1280	674	296	195	133
31	160	---	113	96	---	110	---	1220	---	302	197	---
TOTAL	5180	4251	3574	2997	2630	2883	5497	14535	36591	12108	8056	4551
MEAN	167	142	115	96.7	93.9	93	183	469	1220	391	260	152
AC-FT	10270	8430	7090	5940	5220	5720	10900	28830	72580	24020	15980	9030
MAX	184	160	144	113	102	110	331	1420	2770	645	353	184
MIN	154	122	95	71	89	89	100	202	674	252	193	132
CAL YR	2009	TOTAL	124792	MEAN	342	MAX	1700	MIN	95	AC-FT	247500	
WTR YR	2010	TOTAL	102853	MEAN	282	MAX	2770	MIN	71	AC-FT	204000	

MAX DISCH: 3350 CFS AT 03:15 ON Jun. 08,2010 GH 6.75 FT. SHIFT 0 FT.

MAX GH: 6.75 FT. AT 03:15 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARINGFORKRIVER BELOW MAROON CREEK NEAR ASPEN
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT
Water Year 2010

Location.--	Lat 39° 21'40", Long. 107°01'44" in SW1/4 NE1/4 Sec. 18, T8S, R86W in Pitkin County. Located on left bank of Roaring Fork River, just below Highway 82 bridge, 0.5 mi. above confluence with Fryingpan River, and 2.5 mi. above confluence with Sopris Creek.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Constant Flow Bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The CFB was installed on Oct 20, 2009 to replace a Sutron Model 5600 AccuBubble sensor. The CFB is referenced to an outside cantilever chain gage that is adjacent to the shelter.
Hydrologic Conditions.--	Drainage basin is upper reach of Roaring Fork Valley. Transmountain diversions from several tributaries at the upper end of the basin occur seasonally. Confluence with Fryingpan River is about ½ mi. downstream. The gage is operated from Apr 1 through Sep 30.
Gage-Height Record.--	The primary record is hourly averages of 15-minute CFB data downloaded from the DCP. Satellite-transmitted data are used as backup. The record is complete and reliable for the period of record (Apr 1 – Sep 30, 2010). Calibration corrections to the CFB sensor were made throughout the period of record.
Datum Corrections.--	Levels were run on May 13, 2010. Using RM 1 as a base, the outside cantilever gage was found to read correct and no adjustment was made.
Rating.--	Control is cobble and boulder channel. Left side of channel at gage is deeper with steep bank. Right side of channel slopes gently to a cobble bar with moderate willow growth. At higher stages, flow rises above cobbles and willows on right bank. Minor algae growth occurs. Rating No. 4 was used from April 1 - June 4 until rapidly rising flows filled the left side of the channel with cobbles and boulders and significantly changed hydrologic conditions adjacent to gage. Rating No. 6 was developed on Feb 25, 2011 based on measurements 17-21 and is reasonably defined from 136 cfs to 6,900 cfs (178 % of highest discharge measurement made in WY 2010). Rating No. 5 was found to be invalid after development and immediately replaced by Rating No. 6, which was used from June 5 – Sep 30. The rating needs to be better defined over time. Seven discharge measurements (Nos. 15-21) made during WY 2010 were used for analysis. The measurements range in discharge from 369 to 3860 cfs. Measurement 19 made from the upstream side of the Basalt Avenue was rated as fair due to hydrologic conditions. Measurements cover the range of discharge experienced during the period of record except for the lower daily flows of Apr 3-5, 7, Sep 15-22, 24-30, 2010, and the higher daily flows of Jun 7-10, 2010. The peak discharge of 6630 cfs occurred at 0430 on Jun 8, 2010 at a gage height of 6.28 ft (gage height correction of -0.04 ft applied) with a shift of 0.00 ft. The peak gage height exceeded high measurement 17 by 1.33 ft in stage.
Discharge.--	Shifting section control method was used for the entire period of record. Shifts were distributed by time for the entire period of record. Raw shifts varied between -0.08 to +0.01 ft. Measurements 15, 17-19, and 21 were discounted +2% to -5% to smooth the shift distribution.
Special Computations.--	A hydrographic comparison of ROAFRYCO record was made with downstream gage on Roaring Fork River near Emma (ROAEMMCO) considering estimates of inflow from the Fryingpan River (FRYRUDCO). The comparison shows reasonable consistency between the gages except for the period of May 29 - Jun 5 when the ROAFRYCO discharge was significantly lower than estimated. The low days may be a result of movement of the bubbler orifice pipe as flows rapidly rose.
Remarks.--	Record is rated as good except for the period when gage height was above 3.00 ft, which is rated as fair. Gaging station operated and maintained and record developed by James Kellogg.
Recommendations.--	Continue cooperation with CWCB to design and construct cableway about 700 feet downstream of gaging station. Use cableway to obtain better quality high-stage discharge measurements and better define upper end of stage-discharge rating.

STATE OF COLORADO
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ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT

RATING TABLE--

ROAFRYCO04 USED FROM 01-Apr-2010 TO 04-Jun-2010
ROAFRYCO06 USED FROM 05-Jun-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

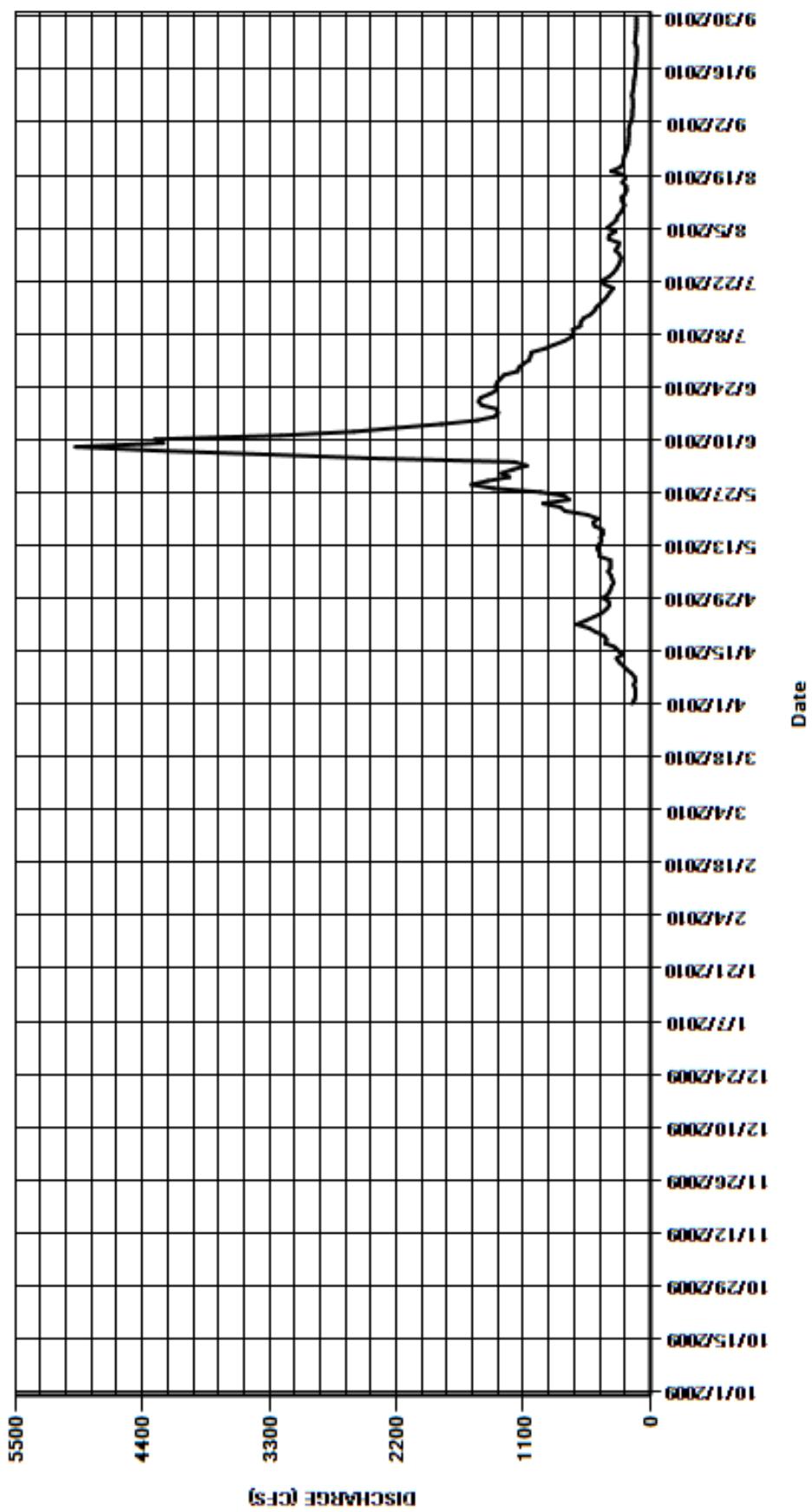
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	159	349	1290	1050	271	181
2	---	---	---	---	---	---	139	339	1190	1040	361	171
3	---	---	---	---	---	---	130	318	1070	1030	359	160
4	---	---	---	---	---	---	130	331	1180	918	303	156
5	---	---	---	---	---	---	132	343	2450	835	374	157
6	---	---	---	---	---	---	145	367	3340	748	333	151
7	---	---	---	---	---	---	131	345	4280	689	296	153
8	---	---	---	---	---	---	136	345	4980	664	288	154
9	---	---	---	---	---	---	163	347	4220	675	259	161
10	---	---	---	---	---	---	204	442	4290	607	240	153
11	---	---	---	---	---	---	235	440	3200	605	225	148
12	---	---	---	---	---	---	272	463	2570	581	244	144
13	---	---	---	---	---	---	294	451	2200	521	252	142
14	---	---	---	---	---	---	245	423	1810	486	219	136
15	---	---	---	---	---	---	278	433	1500	468	207	131
16	---	---	---	---	---	---	310	409	1350	432	211	131
17	---	---	---	---	---	---	393	414	1320	398	244	127
18	---	---	---	---	---	---	380	483	1330	372	219	124
19	---	---	---	---	---	---	403	497	1460	349	231	121
20	---	---	---	---	---	---	474	453	1490	322	341	119
21	---	---	---	---	---	---	532	546	1470	399	262	119
22	---	---	---	---	---	---	641	740	1390	421	236	121
23	---	---	---	---	---	---	559	779	1330	361	233	135
24	---	---	---	---	---	---	488	931	1340	323	226	131
25	---	---	---	---	---	---	422	705	1330	297	213	127
26	---	---	---	---	---	---	383	744	1300	278	202	124
27	---	---	---	---	---	---	357	953	1270	263	194	122
28	---	---	---	---	---	---	361	1360	1150	255	190	120
29	---	---	---	---	---	---	411	1550	1140	270	189	120
30	---	---	---	---	---	---	368	1410	1100	304	186	120
31	---	---	---	---	---	---	---	1220	---	280	190	---
TOTAL	---	---	---	---	---	---	9275	18930	59340	16241	7798	4159
MEAN	---	---	---	---	---	---	309	611	1978	524	252	139
AC-FT	---	---	---	---	---	---	18400	37550	117700	32210	15470	8250
MAX	---	---	---	---	---	---	641	1550	4980	1050	374	181
MIN	---	---	---	---	---	---	130	318	1070	255	186	119

CAL YR	2009	TOTAL	146230	MEAN	799	MAX	2650	MIN	133	AC-FT	290000 (PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	115743	MEAN	632	MAX	4980	MIN	119	AC-FT	229600 (PARTIAL YEAR RECORD)

MAX DISCH: 6630 CFS AT 04:30 ON Jun. 08,2010 GH 6.28 FT. SHIFT 0 FT. (GH CORR. -0.04 FT APPLIED)
MAX GH: 6.28 FT. AT 04:30 ON Jun. 08,2010 (GH CORR. -0.04 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARINGFORKRIVER AB FRYINGPAN RIVER NR BASALT
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

Water Year 2010

Location.--	Lat. 39°14'42", Long. 106°31'50", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 100 ft downstream from diversion dam, 2 mi southwest of Ivanhoe Lake, and 9.1 mi southeast of Norrie, CO.
Drainage and Period of Record.--	18.7 mi ² .
Equipment.--	Sutron Model SDR-0001-4 stage discharge recorder (installed to replace a sutron Model SDR-0001-1 on Jul 22, 2009) in 3'-0" square doghouse style metal-clad shelter on 24" diameter corrugated metal well located directly in stream. SDR is set by drop tape to an inside reference point on edge of equipment shelf. The SDR is hardwired to Chapman control house where a SatLink2 data collection platform (DCP) provides satellite transmission.
Hydrologic Conditions.--	Drainage basin is National Forest land, primarily wilderness area. Diversion dam is just upstream of station. Diverted water and discharge from Fryingpan-Arkansas collection tunnels (north and south tunnels converge above station) flow into Charles H. Boustead Tunnel, which carries water transmountain to the Arkansas River basin (since May 16, 1972). Well and control freeze during winter months.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. The record is complete and reliable for WY 2010, except for Oct 26 - Nov 7, 2009 and Nov 13, 2009- Apr. 20, 2010, when gage stilling well and control were frozen. Minor instrument corrections were applied during the year.
Datum Corrections.--	Levels were run on Oct 6, 2010. Using RM 1 as a base, the gage was found to read correct and no change was made to the R.P.
Rating.--	Channel is composed of boulders and cobbles. Control is a 9.8 ft wide rectangular concrete weir. Rating No. 8 has been in use since Oct 1, 1983. Six discharge measurements (376-381) made during WY 2010 were used for analysis. The measurements ranged in discharge from 12.1 cfs to 93.5 cfs which covered the daily discharge range experienced during the period of record except for lower daily flows on Oct 11,12, 23-31, Nov 1-30, Dec 1-31, Jan 1-31, Feb 1-28, Mar 1-31, Apr 1-26, May 2,3,15, 17-31, Jun 1-5, Aug 3, and Sep 28-30; and higher daily flows of June 23-29. The peak discharge of 130 cfs occurred at 1900 on Jun 9 at a gage height of 2.50 ft with a shift of +.01 ft. The peak gage height exceeded the highest measurement 378 by 0.39 ft in stage.
Discharge.--	Shifts were distributed by time up to the period of frozen gage (Nov 13 through Apr 20) when no shift was applied to estimated daily discharges. Shifts were distributed using variable stage-shift curve FRYIVLCOVS10 from Apr 21 through the end of Water year 2010. Raw shifts ranged from -0.05 ft to +0.01 ft. Measurements 377 and 381 were discounted 3% to 5% to develop the variable stage-shift curve.
Special Computations.--	Average daily discharges for period of frozen well (Oct 26 – Nov 7 and Nov 13 – Apr 20) were estimated from hydrographic comparison with the downstream gage on the Fryingpan River near Thomasville gage (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.
Remarks.--	Record is good except for period of no gage height record, which is poor. Gaging station operated and record developed by Craig Bruner.
Recommendations.--	Develop new rating without the random curvature of Rating No. 8.

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09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

RATING TABLE--

FRYIVLCO08 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

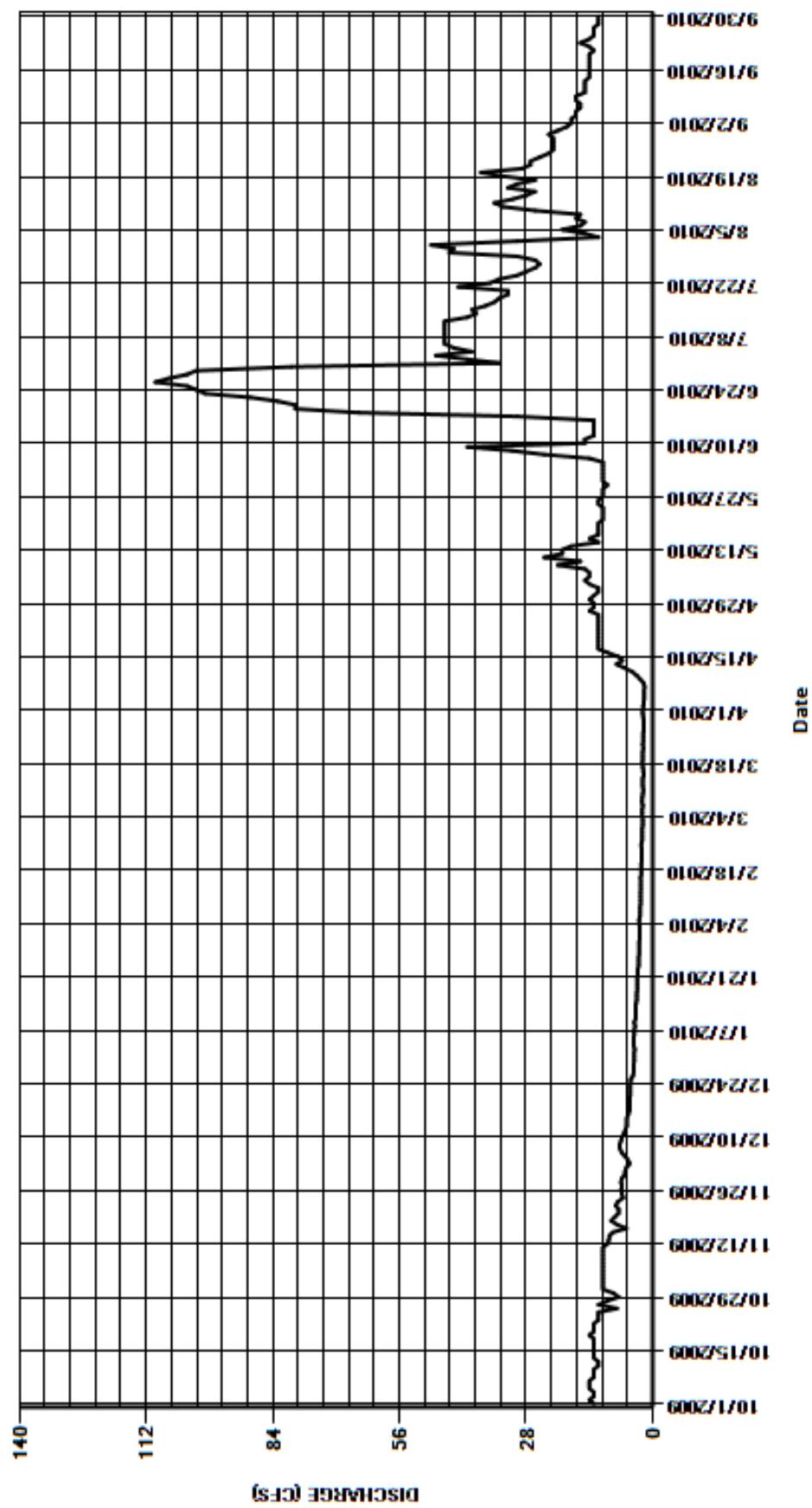
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	11	6.1	4.1	2.9	2.3	2.2	13	11	34	49	19
2	14	11	5.8	4	2.9	2.2	2.1	12	11	41	30	18
3	13	11	5.1	4.2	2.9	2.2	2	12	11	48	12	18
4	13	11	5.5	4.2	3	2.3	1.9	14	11	40	15	17
5	14	11	6.2	4.2	3	2.3	1.9	15	11	44	20	17
6	14	11	6.9	4.1	2.8	2.3	1.9	14	14	46	16	16
7	14	11	7.3	4.1	2.8	2.2	1.8	14	24	46	15	16
8	13	11	7.3	3.9	2.8	2.4	2	15	31	46	17	17
9	13	11	7	4.1	2.7	2.3	2.7	21	41	46	16	17
10	13	11	6.8	3.8	2.7	2.2	3.5	16	15	46	26	15
11	12	11	6.3	3.8	2.7	2.1	4.5	24	15	46	33	15
12	12	10	6	3.8	2.7	2.2	6.2	20	13	46	35	15
13	13	9.7	5.7	3.8	2.6	2.2	8	20	13	41	31	15
14	13	9.6	5.7	3.7	2.6	2.2	6.7	18	13	39	28	14
15	13	8.8	5.7	3.5	2.6	2	7.6	12	13	40	26	14
16	13	5.8	5.4	3.5	2.7	2.1	9.9	14	13	37	32	14
17	13	7.9	5.1	3.5	2.5	2.2	12	12	30	35	30	14
18	13	9.2	5.1	3.4	2.5	2.3	12	12	65	34	26	14
19	14	8.4	5.1	3.4	2.5	2.2	12	12	79	32	33	14
20	13	7.5	5.1	3.4	2.5	2.2	12	12	79	32	38	14
21	13	7.5	5	3.4	2.4	2.2	12	11	83	43	29	13
22	13	8.2	5	3.3	2.4	2.1	12	11	89	36	27	14
23	12	7.7	5	3.3	2.4	2.2	12	11	99	34	27	16
24	12	6.6	4.9	3.1	2.5	2.1	12	11	101	30	25	14
25	12	6.8	4.9	3.1	2.5	2.1	12	12	103	28	23	13
26	7.9	7	4.4	3.1	2.3	2.1	12	12	110	26	22	13
27	12	6.8	4.2	3	2.3	2	14	11	107	25	22	13
28	10	7	4.2	3	2.3	2	13	11	103	26	22	12
29	7.5	6.9	4.2	3	---	2	13	11	101	30	22	12
30	8.7	6.2	4.1	3	---	2.1	14	10	80	45	23	12
31	11	---	4.1	2.9	---	2.2	---	11	---	44	21	---
TOTAL	382.1	268.6	169.2	110.7	73.5	67.5	238.9	424	1489	1186	791	445
MEAN	12.3	8.95	5.46	3.57	2.62	2.18	7.96	13.7	49.6	38.3	25.5	14.8
AC-FT	758	533	336	220	146	134	474	841	2950	2350	1570	883
MAX	14	11	7.3	4.2	3	2.4	14	24	110	48	49	19
MIN	7.5	5.8	4.1	2.9	2.3	2	1.8	10	11	25	12	12
CAL YR	2009	TOTAL	3973.4	MEAN	10.9	MAX	50	MIN	2.8	AC-FT	7880	
WTR YR	2010	TOTAL	5645.5	MEAN	15.5	MAX	110	MIN	1.8	AC-FT	11200	

MAX DISCH: 130 CFS AT 19:00 ON Jun. 09,2010 GH 2.5 FT. SHIFT 0.01 FT.

MAX GH: 2.5 FT. AT 19:00 ON Jun. 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09077610 IVANHOE CREEK NEAR NAST
Water Year 2010

Location.-- Lat. 39°17'13", Long. 106°33'31", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 60 ft upstream from culvert under Nast Tunnel, 300 ft downstream from diversion dam, 2.3 mi east of Nast, and 5.8 mi southeast of Norrie, CO.

Drainage and Period of Record.-- 9.43 mi².

Equipment.-- Sutron Model SDR-001-4 stage discharge recorder (SDR) housed in a 3'-0" square metal-clad shelter on 24" diameter corrugated metal well located directly in stream. The SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. SDR is set by drop tape to inside reference point.

Hydrologic Conditions.-- Basin is approximately 9.43 sq. mi. USFS land with several seasonal roads. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- The primary record is hourly averages of 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. The record is complete and reliable for Water Year 2010, except for Oct 26 - Nov 6, 2009, and Nov 12, 2009 - Apr 18, 2010, when the gage stilling well and control were frozen and Apr 30 - May 4 when there was a problem with the SDR. Minor instrument corrections were made throughout WY2010.

Datum Corrections.-- Levels were not run in WY2010. Levels were run to the inside gage R.P. on Jul 31, 2009. Using RM 3 as a base, the gage was found to read correct and no adjustment to the RP was made.

Rating.-- Low water control is 120 degree v-notch weir approximately 30 ft below gage. High water control is 8 ft diameter culvert and concrete headwall adjacent to weir. Rating No. 4 has been in use since October 1, 1996. Six discharge measurements (236-241) made during Water Year 2010 were used for analysis. The measurements ranged from 1.44 to 3.01 cfs, which covered the daily discharge range experienced during the period of record except for lower daily flows on Oct 1-6, 9-16, 24, 26, 29-30; Nov 16-17, 20-21, 23-30; Dec 1-6, 9-31; Jan 1-31; Feb 1-28; Mar 1-31; Apr 1-8, 30; May 1; and Sep 16-22, 24-30 and higher daily flows on Apr 11-20, 28; May 4-17, 27-31; Jun 1-11, 30; Jul 16-22, 30-31; and Aug 1-2, 16-17, 19-21. The peak discharge of 145 cfs occurred at 2130 on Jun 6, 2010 at a gage height of 3.40 ft (gage height correction of +0.01 ft applied) with a shift of 0.00 ft. The peak gage height exceeded high measurement 239 by 2.53 feet in stage.

Discharge.-- A shifting control method was used for all of Water Year 2010. Variable stage-shift curve IVCRNACOVS10 was defined by measurement 237-241 and the two highest historic measurements. Shifts were distributed by time from Oct 1 - Oct 25 and Nov 7 - Nov 11, 2009. The shifts were applied using variable stage-shift curve IVCRNACOVS10 from Apr 19 - Apr 29 and May 5 - Sep 30, 2010. Shifts were not applicable for periods of no gage height. Discharge measurements indicate raw shifts ranging from -0.03 ft to 0.02 ft. Measurements 236, 238, and 240 were not given full weight and were discounted from -3% to +8% to smooth shift distribution and develop the variable stage-shift relationship.

Special Computations.-- Average daily discharge for days with no gage height record (Oct 26 - Nov 6, Nov 12 - Apr 18 and Apr 30 - May 4) were estimated from hydrographic comparison with the downstream gage on the Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good except for periods of ice-affected gage height and SDR malfunction, which are poor. Due to lack of rating definition above 50 cfs as confirmed by recent high flow measurements, periods of mean daily flow above 50 cfs (including the peak flow) should be considered poor. Station maintained and record developed by Craig Bruner.

Recommendations.-- An adjustable R.P. needs to be installed in the equipment shelter. Make site visit(s) on snowmobiles or ATVs in April and/or May to evaluate ice condition in channel, control, and stilling well. Request that USBR record all gage visits and activity on station visit log. Determine stage-discharge break-points during level run. Run levels and refine stage-discharge rating.

STATE OF COLORADO
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09077610 IVANHOE CREEK NEAR NAST

RATING TABLE--

IVCRNAC004 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	1.8	1.2	1	0.9	0.9	1.2	1	6.8	2.2	5.6	2.3
2	1.1	1.8	1.2	1	0.9	0.9	1.2	1.9	4.4	2.2	4.5	2.1
3	1.2	1.7	1	1	0.9	0.9	1.2	2.7	3.3	2.2	2.2	2
4	1.1	1.7	1.1	1	0.9	0.9	1.2	4	4.8	2.2	2.2	1.9
5	1.1	1.8	1.2	1	0.9	0.9	1.2	5.8	31	2.2	2.2	1.9
6	1.3	1.8	1.4	1	0.9	0.9	1.2	8	64	2.2	2.2	1.8
7	1.5	1.6	1.5	1	0.9	0.9	1.2	7.6	96	2.2	2.2	1.7
8	1.5	1.6	1.5	1	0.9	1	1.3	8	52	2.2	2.2	1.9
9	1.4	1.5	1.4	1	0.9	1	1.8	8.4	27	2.2	2.2	2.1
10	1.4	1.5	1.4	1	0.9	0.9	2.5	4.8	8.9	2.2	2.2	1.8
11	1.3	1.5	1.3	1	0.9	0.9	3.3	8.1	3.6	2.2	2.2	1.7
12	1.2	1.8	1.2	1	0.9	1	4.7	5.4	2.2	2.2	2.2	1.7
13	1.2	1.7	1.2	1	0.9	1	6.2	5.8	2.2	2.2	2.2	1.6
14	1.3	1.7	1.2	1	0.9	1	5.4	6.6	2.2	2.2	2.2	1.6
15	1.4	1.6	1.2	0.9	0.9	0.9	6.4	3.9	2.2	2.2	2.6	1.5
16	1.4	1.1	1.2	0.9	0.9	1	8.6	4.8	2.2	5.4	3.5	1.4
17	1.6	1.4	1.1	0.9	0.9	1	11	3.7	2.2	8.1	3.3	1.3
18	1.8	1.7	1.1	0.9	0.9	1.1	11	2.6	2.1	7.7	3	1.1
19	1.9	1.5	1.1	0.9	0.9	1.1	52	2.5	2.1	5.4	3.7	1
20	1.7	1.4	1.1	0.9	0.9	1.1	13	2.5	2.1	3.7	4.8	1
21	1.6	1.4	1.1	0.9	0.9	1.1	2.5	2.3	2.1	5.5	3.2	0.96
22	1.5	1.5	1.1	0.9	0.9	1.1	2.4	2.4	2.1	3.5	3	0.99
23	1.5	1.4	1.1	0.9	0.9	1.1	2.3	2.4	2.1	2.9	3	1.9
24	1.4	1.2	1.1	0.9	0.9	1.1	2.3	2.2	2.1	2.5	2.9	1.3
25	1.5	1.3	1.1	0.9	0.9	1.1	2.3	2.1	2.1	2.4	2.7	0.99
26	1.1	1.3	1	0.9	0.9	1.1	2.3	2.4	2.1	2.3	2.6	0.93
27	1.7	1.3	1	0.9	0.9	1.1	2.3	3.1	2.1	2.1	2.5	0.87
28	1.5	1.3	1	0.9	0.9	1.1	7.6	5.1	2.1	2.2	2.5	0.86
29	1.1	1.3	1	0.9	---	1.1	2.5	4.1	2.2	3	2.5	0.84
30	1.3	1.2	1	0.9	---	1.2	1	3.3	3.7	5.8	2.6	0.84
31	1.7	---	1	0.9	---	1.2	---	3.1	---	4.7	2.4	---
TOTAL	43.5	45.4	36.1	29.30	25.20	31.60	163.1	130.6	344.0	100.2	87.3	43.88
MEAN	1.4	1.51	1.16	0.95	0.9	1.02	5.44	4.21	11.5	3.23	2.82	1.46
AC-FT	86	90	72	58	50	63	324	259	682	199	173	87
MAX	1.9	1.8	1.5	1	0.9	1.2	52	8.4	96	8.1	5.6	2.3
MIN	1.1	1.1	1	0.9	0.9	0.9	1	1	2.1	2.1	2.2	0.84

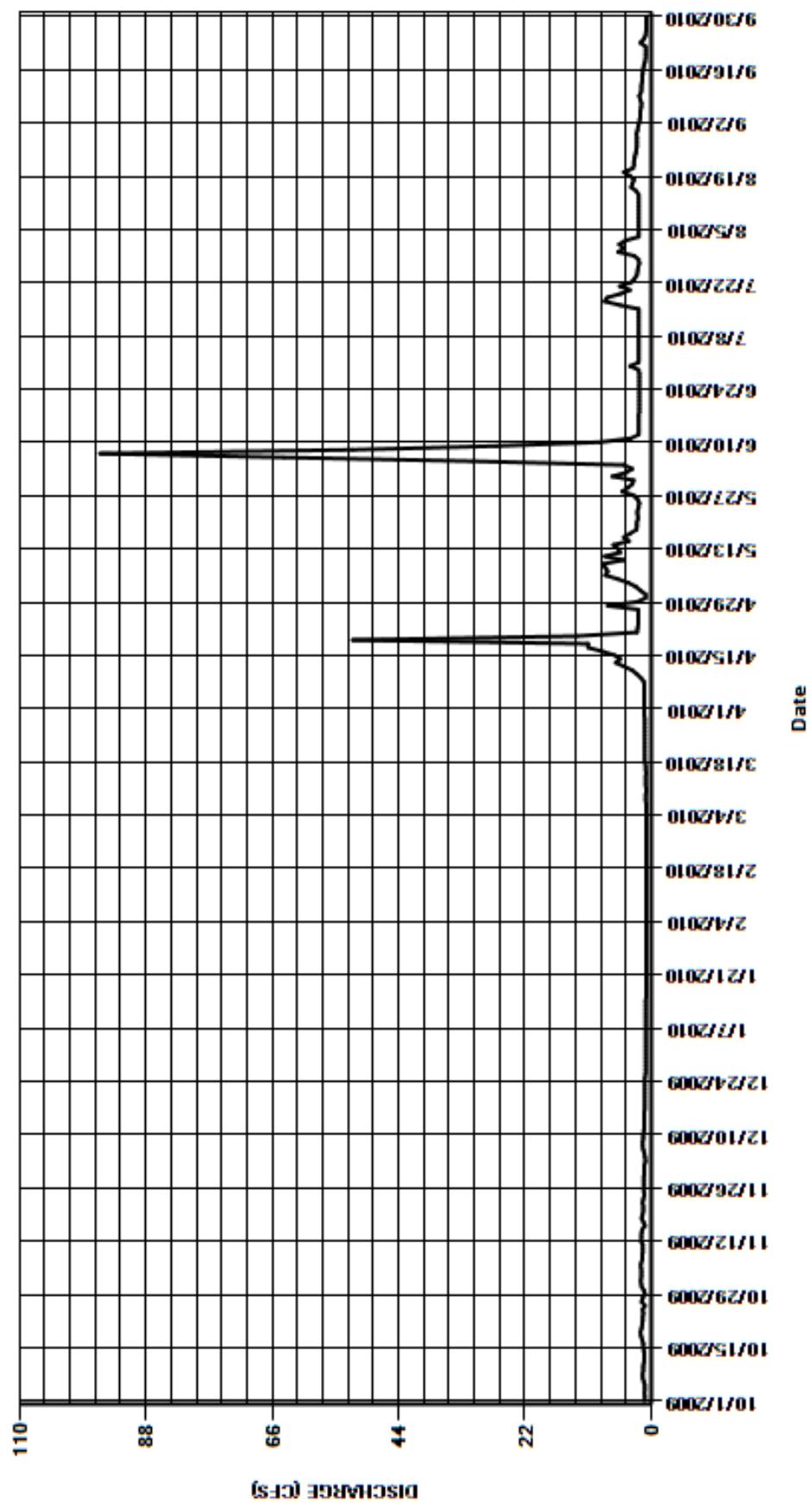
CAL YR	2009	TOTAL	762.33	MEAN	2.09	MAX	33	MIN	0.62	AC-FT	1510
WTR YR	2010	TOTAL	1080.18	MEAN	2.96	MAX	96	MIN	0.84	AC-FT	2140

MAX DISCH: 145 CFS AT 21:30 ON Jun. 06,2010 GH 3.4 FT. SHIFT 0 FT. (GH CORR. = +0.01 FT APPLIED)

MAX GH: 3.4 FT. AT 21:30 ON Jun. 06,2010 (GH CORR. = +0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077610 IVANHOE CREEK NEAR NAST
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE
Water Year 2010

Location.-- Lat. 39°14'20", Long. 106°35'24", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 300 ft downstream from diversion dam, 5.2 mi upstream from mouth, and 7.2 mi southeast of Norrie, CO.

Drainage and Period of Record.-- 11.5 mi².

Equipment.-- Sutron Model SDR-0001-4 stage discharge recorder (SDR) on rectangular platform with removable steel cover on 12-in diameter corrugated metal well located directly in stream. The SDR is hard-wired to Chapman Control House and configured to transmit 4-20 mA gage height via satellite. SDR is set by drop tape to a reference point (1/4 in brass bolt) on outside of downstream side of shelter previously used for a graphic recorder.

Hydrologic Conditions.-- Drainage Basin is approximately 11.5 sq. mi. of National Forest land, primarily wilderness area. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.

Gage-Height Record.-- The primary record is hourly averages of 15-minute data downloaded from the SDR. The record is complete and reliable for Water Year 2010, except for the periods Oct 27 - Nov 1, 2009; Nov 16, 2009 - Apr 10, 2010 when the gage stilling well was frozen; and Apr 14 - Apr 16, 2010 when the gage height data was unreliable.

Datum Corrections.-- Levels were run to outside gage RP on Jul 24, 2009. Using RM 2 as a base, the gage was found to read correct. An RP adjustment was not required.

Rating.-- Control is 6.2 ft wide sharp crested concrete weir with a 6 ft concrete apron above the crest. Rating No. 9 has been in use since May 2, 2005 and is reasonably well-defined from 5 to 115 cfs. Five discharge measurements (343-347) made during Water Year 2010, and measurement 348 made subsequently, were used for analysis. Measurements range in discharge from 7.23 to 22.5 cfs, and covered the range experienced during the period of record except for lower daily flows on Oct 2-4, 6, 8-17, 20-26, 29, 30; Nov 1-9, 12-30; Dec 1-31; Jan 1-31; Feb 1-28; Mar 1-31; Apr 1-19, 26-30; May 1-9, 15, 16, 22-24; Jun 12-17; Jul 2-4; Aug 3; and Sep 14-22, 24-30; and higher daily flows on May 28-29; Jun 4-10, 23-30; Jul 21, 30-31; and Aug 1-2, 5, 8-9, 20. The peak discharge of 191 cfs occurred at 1845 on Jun 6, 2010 at a gage height of 4.93 ft (gage height correction of +0.01 ft applied) with a shift of +0.09 ft. The peak discharge exceeded high measurement 346 by 2.40 ft in stage.

Discharge.-- Shifting section control method was used for all of Water Year 2010. Variable stage-shift curve FRYSFUCOVS10 was defined by measurements 344 – 346 and historic high measurement 297. Shifts were applied and distributed by time up until the period of frozen well. Shifts were calculated using FRYSFUCOVS10 from the day of well thaw on Apr 11 until Sep 9. Shifts were distributed by time from Sep 9-30. Measurements indicate raw shifts ranging from 0.00 ft to +0.05 ft. Measurements 344, 345, and 347 were discounted -2% to +4% to develop the variable stage-shift relationship and smooth the shift distribution.

Special Computations.-- Discharge for days with no gage height record were estimated by hydrographic comparison with downstream gage on Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas Project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.

Remarks.-- Record is good, except for periods of no gage height record which are rated as poor. Station maintained by Craig Bruner. Record developed by Craig Bruner and James Kellogg.

Recommendations.-- Make site visit on snow mobiles or ATVs in April/May (depending on avalanche hazard at mile marker 9 on road) to evaluate ice condition in channel, control, and stilling well. Monitor diversions for high flow measurement opportunity. Evaluate potential for a new rating that plots to the right of Rating 9.

STATE OF COLORADO
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09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE

RATING TABLE-- FRYSFUCO09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.3	7.1	2.7	1.9	1.4	1.2	1.3	6.2	9.2	8.6	53	11
2	7.2	6.6	2.6	1.8	1.4	1.1	1.2	5.9	7.4	6.1	31	10
3	7.1	6.3	2.2	1.9	1.4	1.1	1.2	5.5	7.5	6.1	6.8	9.5
4	6.9	6.2	2.4	1.9	1.4	1.2	1.2	4.8	29	6.1	17	9.1
5	7.4	6.1	2.7	1.9	1.4	1.2	1.1	4.9	69	9.1	24	8.8
6	7.1	6	3	1.9	1.4	1.2	1.2	4.8	86	14	15	8.4
7	7.5	5.8	3.2	1.9	1.3	1.2	1.1	5.1	73	16	21	8.2
8	6.7	5.3	3.2	1.8	1.3	1.3	1.2	5.4	56	16	30	8.9
9	6.4	5	3.1	1.9	1.3	1.2	1.7	6.7	69	16	25	8.8
10	6.2	12	3	1.8	1.3	1.1	2.2	8.1	25	16	22	8
11	5.9	10	2.8	1.8	1.3	1.1	3	8.9	8.5	14	20	7.7
12	5.6	4.4	2.7	1.7	1.3	1.2	5.6	8.6	7	11	15	7.5
13	6	4.3	2.5	1.7	1.3	1.2	3.7	8.2	7	7.7	11	7.3
14	6	3.9	2.5	1.7	1.3	1.2	3.1	7.8	7	8	14	7
15	6.5	3.8	2.5	1.6	1.3	1.1	3.7	7.2	7	14	13	6.8
16	6.4	2.5	2.4	1.6	1.3	1.1	5.1	6.8	7	20	18	6.6
17	7	3.4	2.3	1.6	1.3	1.2	6.6	7.3	7	18	18	6.5
18	7.6	4	2.3	1.6	1.3	1.2	5.9	7.9	11	17	15	6.3
19	7.7	3.6	2.3	1.6	1.2	1.2	7.1	8.1	11	17	22	6.2
20	7	3.3	2.3	1.6	1.2	1.2	7.6	7.9	12	16	26	6.1
21	6.9	3.3	2.3	1.6	1.2	1.2	7.7	7.3	19	26	18	5.9
22	6.5	3.6	2.2	1.6	1.2	1.2	7.7	7.1	19	20	16	6.9
23	6.2	3.3	2.2	1.6	1.2	1.2	7.7	7	30	18	16	9.2
24	5.9	2.9	2.2	1.5	1.3	1.2	7.7	7.1	34	16	15	7.2
25	5.9	3	2.2	1.5	1.3	1.2	7.4	7.3	31	15	14	6.6
26	7	3.1	2	1.5	1.2	1.2	6.2	7.5	28	14	13	6.2
27	9.6	3	1.9	1.4	1.2	1.1	6	7.5	28	13	12	6
28	8.1	3	1.9	1.4	1.2	1.1	5.9	24	34	14	12	5.8
29	5.6	3	1.9	1.4	---	1.2	5.8	34	45	22	12	5.6
30	6.1	2.7	1.9	1.4	---	1.2	6	17	37	35	14	5.5
31	7.3	---	1.9	1.4	---	1.3	---	15	---	35	12	---
TOTAL	210.6	140.5	75.3	51.5	36.2	36.6	132.9	276.9	820.6	484.7	570.8	223.6
MEAN	6.79	4.68	2.43	1.66	1.29	1.18	4.43	8.93	27.4	15.6	18.4	7.45
AC-FT	418	279	149	102	72	73	264	549	1630	961	1130	444
MAX	9.6	12	3.2	1.9	1.4	1.3	7.7	34	86	35	53	11
MIN	5.6	2.5	1.9	1.4	1.2	1.1	1.1	4.8	7	6.1	6.8	5.5

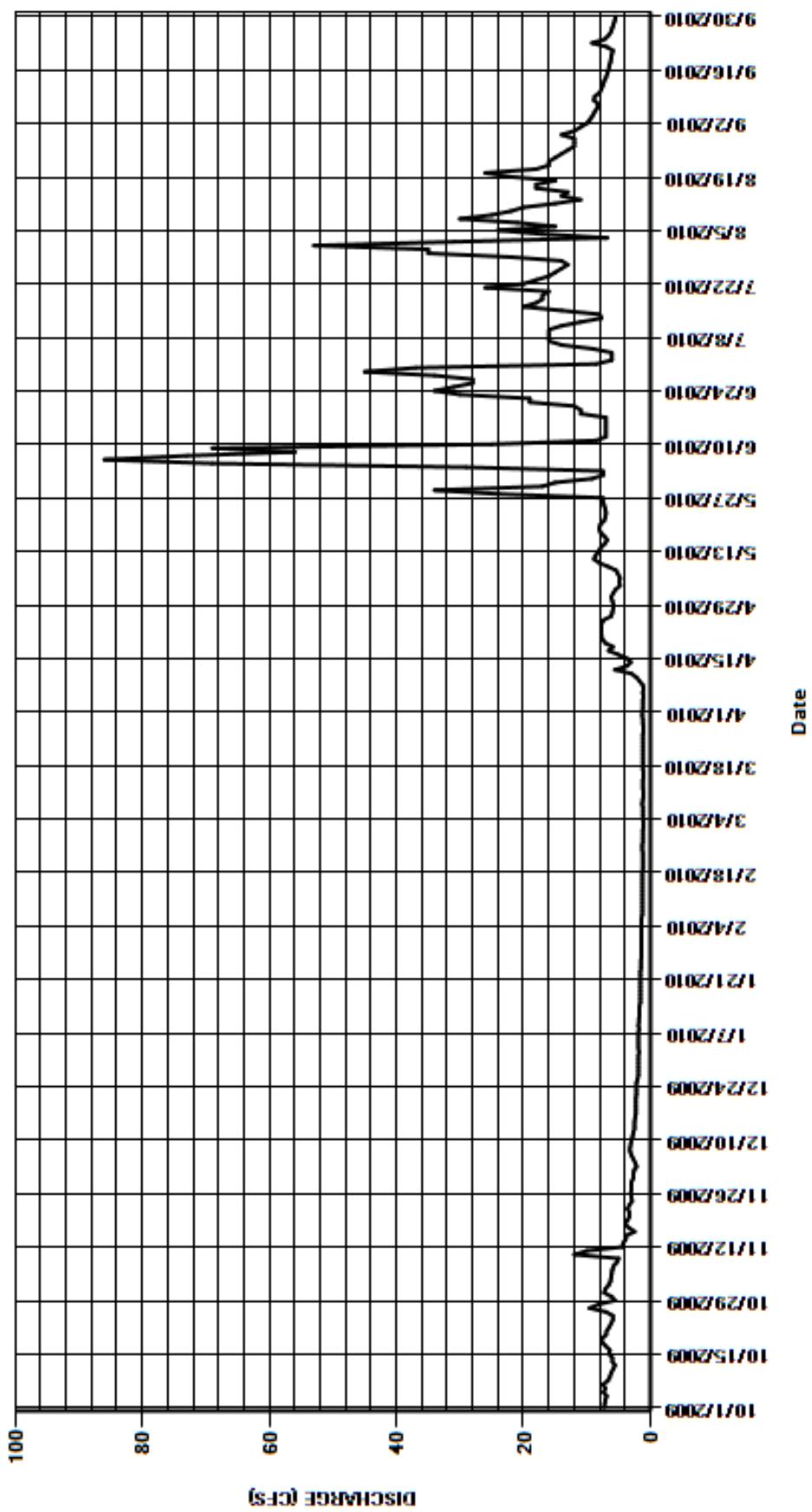
CAL YR	2009	TOTAL	2741.9	MEAN	7.51	MAX	33	MIN	1.6	AC-FT	5440
WTR YR	2010	TOTAL	3060.2	MEAN	8.38	MAX	86	MIN	1.1	AC-FT	6070

MAX DISCH: 191 CFS AT 18:45 ON Jun. 06,2010 GH 4.93 FT. SHIFT 0.09 FT. (GH CORR. 0.01 FT APPLIED)

MAX GH: 4.93 FT. AT 18:45 ON Jun. 06,2010 (GH CORR. 0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077800 SOUTH FORK FRYING PAN RIVER AT UPPER STATION NEAR NORRIE
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09077945 CHAPMAN GULCH NEAR NAST
Water Year 2010

Location.--	Lat. 39°15'51", Long. 106°37'54", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 700 ft downstream from Chapman diversion tunnel, 3.3 mi upstream from mouth, and 4.3 mi south of Norrie, CO.
Drainage and Period of Record.--	5.99 mi ² .
Equipment.--	Sutron model SDR-0001-4 stage discharge recorder and a graphic water-stage recorder in 3 feet square metal-clad shelter on a 24 inch diameter corrugated metal well located directly in stream. SDR and graphic recorder are equipped with separate floats and set to an inside reference point with a drop tape. SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. The graphic water-stage recorder was removed from the shelter at the end of Water Year 2010.
Hydrologic Conditions.--	Basin is almost entirely roadless National Forest land. Chapman Diversion for Fryingpan-Arkansas Project is just upstream of gaging station. Hunter Tunnel discharges above the diversion. During winter, ground water seepage from the tunnel flows into the stream and keeps control and gaging station free of ice.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data downloaded from the SDR with chart record used as backup. The record is complete and reliable for the entire WY 2010. Checks between the primary and backup records agreed within +/- 0.02 ft. Instrument corrections were made to the SDR and chart recorder throughout the period of record.
Datum Corrections.--	Levels were run to inside gage on Jul. 31, 2009. Using RM 1 as a base, the gage was found to read 0.02 ft low and the RP was corrected.
Rating.--	Low water control is 120-degree (v-notch) weir approximately 12 ft below gage. High water control is the channel and channel banks. Rating No. 6 was used for the period Oct 1-19 2009. Rating No. 7 was developed on Dec. 3, 2010 due to non-linear characteristics of Rating 6 when hydraulic head was plotted against discharge in log-log space. The new rating is well defined from about 1.0 to 100 cfs and was applied for the remainder of the water year. Nine discharge measurements (Nos. 372-380) were made during WY 2010. Meas. 381 made subsequently was also used for analysis. Measurements range from 1.24 to 7.62 cfs and cover the range experienced during the year except for lower daily flows on Feb 4-28; Mar 1-6, 13-15, 19-31; and Apr 1-7 and higher daily flows of May 29-31; Jun 1-2, 4-9, 29-30; and Jul 16-31, and Aug 1-9, 19-25. The peak discharge of 150 cfs occurred at 1600 on Jun. 6 at a gage height of 4.14 ft (gage height correction of -0.01 ft applied) with a shift of -0.01 ft. The peak gage height exceeded the highest measurement 379 by 2.07 ft in stage.
Discharge.--	Shifting section control method was used for WY 2010. Shifts were applied and distributed by time for the entire period of record. Raw shifts ranged from -0.03 ft to +0.01 ft. Measurement 372 was discounted -4% during working the WY 2009 record to smooth the shift distribution. It appears that changing approach velocities between gage heights 1.7 and 1.9 and over-topping the weir at gage height 2.86 ft have a significant effect on shifts.
Special Computations.--	None required for WY 2010. Intermittent discharge of water diverted from other stream basins in the collection system makes it difficult to estimate gage height from comparison with FRYTHOCO when the Fry-Ark system is operating.
Remarks.--	Record is rated as good. Gaging station operated and record developed by James Kellogg.
Recommendations.--	Make measurements later in day during May through July and try to better define the upper end of the rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077945 CHAPMAN GULCH NEAR NAST

RATING TABLE--

CHAGULCO06 USED FROM 01-Oct-2009 TO 19-Oct-2009
CHAGULCO07 USED FROM 19-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

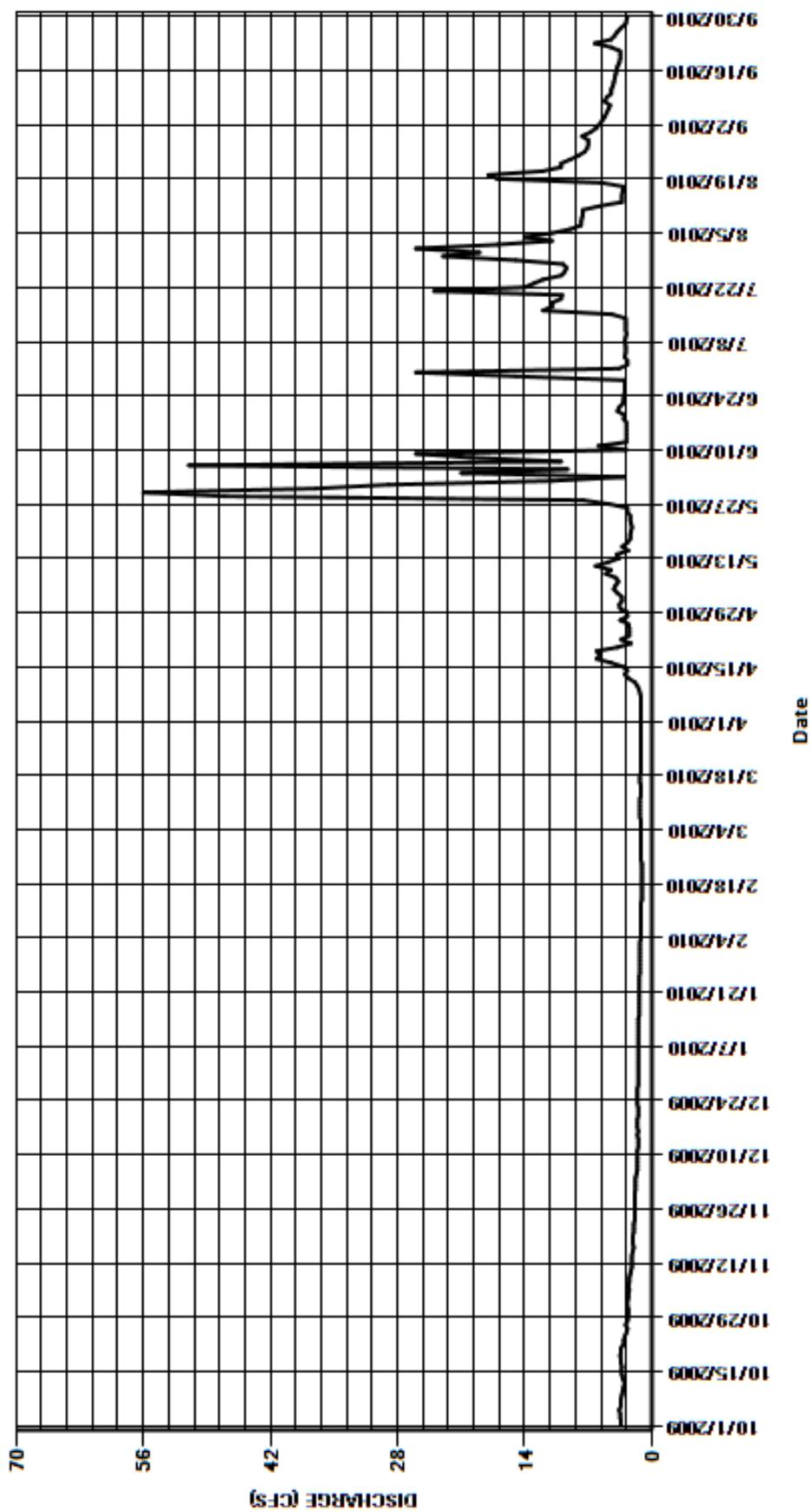
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.4	2.7	1.8	1.5	1.3	1.2	1.2	3.6	29	3.6	26	6.2
2	3.4	2.7	1.8	1.5	1.3	1.2	1.2	3.3	11	2.7	17	5.8
3	3.5	2.6	1.8	1.5	1.3	1.2	1.2	3.3	3	2.7	11	5.5
4	3.5	2.6	1.8	1.5	1.2	1.2	1.2	3.8	21	3	14	5.2
5	3.6	2.5	1.7	1.5	1.2	1.2	1.2	4.2	9.3	2.9	11	5
6	3.4	2.6	1.6	1.5	1.2	1.2	1.2	4	51	2.9	9	4.8
7	3.4	2.5	1.6	1.5	1.2	1.3	1.2	3.7	10	2.9	7.8	4.6
8	3.4	2.5	1.6	1.5	1.2	1.3	1.3	4	20	3	7.8	5.2
9	3.3	2.4	1.6	1.5	1.2	1.3	1.4	5.1	26	2.9	7.7	5
10	3.2	2.3	1.6	1.5	1.2	1.3	1.6	4.5	2.8	2.8	7.6	4.5
11	3.1	2.2	1.6	1.5	1.2	1.3	1.9	6.2	5.9	2.9	7.6	4.5
12	3	2.2	1.5	1.5	1.2	1.3	2.6	4.8	2.8	2.9	5.7	4.3
13	3.2	2.2	1.5	1.5	1.2	1.2	3	3.6	2.8	2.9	3.3	4.2
14	3.3	2.2	1.5	1.5	1.1	1.2	2.7	3.9	2.8	2.9	3.3	4.1
15	3.4	2.1	1.6	1.4	1.1	1.2	3.2	2.6	2.8	4.4	3.3	4
16	3.3	2	1.5	1.4	1.1	1.3	4.5	3.3	2.8	12	3.2	3.9
17	3.4	2.1	1.6	1.4	1.1	1.3	6.1	2.7	2.8	11	3.1	3.8
18	3.4	2.1	1.6	1.4	1.1	1.3	5.7	2.4	3.1	11	5.6	3.6
19	3.5	2.1	1.6	1.4	1.1	1.2	6.1	2.4	3	10	17	3.5
20	3.4	2	1.5	1.4	1.1	1.2	3.8	2.3	3.8	9.9	18	3.5
21	3.4	2	1.5	1.4	1.1	1.2	2.3	2.2	3.6	24	12	3.5
22	3.1	2	1.5	1.4	1.1	1.2	3.4	2.3	3.2	14	10	4.5
23	3.1	1.9	1.6	1.4	1.1	1.2	2.5	2.4	3.1	13	10	6.3
24	3	1.9	1.6	1.4	1.2	1.2	2.5	2.4	3.1	12	9	4.5
25	2.8	1.9	1.6	1.4	1.2	1.2	2.5	2.7	3	10	8.1	4.1
26	2.7	1.9	1.6	1.3	1.2	1.2	2.6	2.7	3	9.6	7.4	3.8
27	2.9	1.9	1.6	1.3	1.2	1.2	3.5	4.7	3	9.4	7.1	3.4
28	2.7	1.9	1.5	1.3	1.2	1.2	2.7	7.6	3	9.8	7	2.9
29	2.6	1.9	1.5	1.3	---	1.2	2.7	47	15	15	7	2.8
30	2.6	1.9	1.5	1.3	---	1.2	3.5	56	26	23	7.7	2.7
31	2.6	---	1.5	1.3	---	1.2	---	37	---	19	6.8	---
TOTAL	98.6	65.8	49.4	44.2	32.9	38.1	80.5	240.7	281.7	258.1	281.1	129.7
MEAN	3.18	2.19	1.59	1.43	1.18	1.23	2.68	7.76	9.39	8.33	9.07	4.32
AC-FT	196	131	98	88	65	76	160	477	559	512	558	257
MAX	3.6	2.7	1.8	1.5	1.3	1.3	6.1	56	51	24	26	6.3
MIN	2.6	1.9	1.5	1.3	1.1	1.2	1.2	2.2	2.8	2.7	3.1	2.7

CAL YR	2009	TOTAL	1528.1	MEAN	4.19	MAX	38	MIN	1.4	AC-FT	3030
WTR YR	2010	TOTAL	1600.8	MEAN	4.39	MAX	56	MIN	1.1	AC-FT	3180

MAX DISCH: 150 CFS AT 16:00 ON Jun. 09,2010 GH 4.14 FT. SHIFT -0.01 FT. (GH CORR. -0.01 FT APPLIED)
MAX GH: 4.14 FT. AT 16:00 ON Jun. 09,2010 (GH CORR. -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077945 CHAPMAN GULCH NEAR NAST
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE
Water Year 2010

Location.--	Lat. 39°20'34", Long. 106°39'55", in SE 1/4 NW 1/4 sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on left bank, 800 ft upstream from bridge on county road, 0.4 mi upstream from mouth, 0.5 mi downstream from Last Chance Creek, and 1.3 mi northwest of Norrie, CO.
Drainage and Period of Record.--	42 mi ² .
Equipment.--	Graphic water stage recorder and Sutron Model 56-0540 shaft encoder and SatLink2 data collection platform housed in 42-in. diameter corrugated metal shelter and stilling well. The shaft encoder and graphic recorder are equipped with separate floats and set by drop tape to an adjustable reference point on edge of recorder shelf. An air temperature sensor is mounted on exterior of shelter.
Hydrologic Conditions.--	Basin is primarily USFS land. Diversions for the Fryingpan-Arkansas Project occur in several tributaries upstream of the station. Well and intakes are frozen in winter.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data transmitted by satellite with chart recorder data used for backup. The record is complete and reliable, except for the period of Nov 16 through May 15 when the well was frozen. No flush corrections were applied in WY2010. Minor instrument corrections were applied during the period of record.
Datum Corrections.--	Levels were not run in WY 2010. Levels were last run on Jul 7, 2009 to the inside gage reference point using R.M. 1 as base. The gage was found to read correct and the RP was not adjusted.
Rating.--	Control is channel and large boulder 50 feet downstream of gage. Rating 10 was used until the beginning of the frozen gage period. Rating 11 was developed as a more precise fit to the last 5 years of measurement data and to account for higher flows in WY2010 that were above Rating 10. The new rating was applied to gage height data from May 16 (end of frozen gage period) until the end of WY2010. Ten discharge measurements (808-817) made during WY2010 were used for analysis. The measurements ranged in discharge from 4.25 to 89.9 cfs and cover the range experienced during the year except for the higher daily flows of May 19, 21-31; and Jun 1-15 and lower daily flows of Sep 6-8, 11-22, and 26-30. The peak discharge of 863 cfs occurred at 2345 on Jun 5 at a gage height of 5.32 ft (gage height correction of -0.01 ft applied) with a shift of 0.00 ft. The peak gage height exceeded high measurement 813 by 1.74 ft. in stage.
Discharge.--	Shifts were distributed by time up to the period of frozen gage (Nov 16 through May 15) when no shift was applied to estimated daily discharges. Variable shift curve FRYNFNCOVS10 was used following the period of no gage height through the end of Water Year 2010. Raw shifts ranged from -.07 to +0.07 ft. Measurements 808 and 813-816 were discounted -8% to +2% to smooth the shift distribution and develop the variable stage shift curve. Measurements 809-812 were made during the period of no gage height when the stilling well was frozen.
Special Computations.--	Average daily discharge for period of frozen was estimated by winter ice measurements and hydrographic comparison with average daily discharge measured at the Fryingpan River near Thomasville gage.
Remarks.--	Record is rated good except for periods of no gage height record (frozen well), which are considered poor. Days with average daily flows greater than 180 cfs (twice the highest measurement of 90 cfs made in WY 2010) should also be considered poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	Run levels in WY2011 and survey potential break-points to refine stage-discharge rating.

STATE OF COLORADO
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09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE

RATING TABLE--

FRYNFNCO10 USED FROM 01-Oct-2009 TO 15-May-2010
FRYNFNCO11 USED FROM 16-May-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.9	7.9	6.3	5	4.5	4.5	6.5	32	192	30	23	6
2	4.7	8	6	5	4.5	4.5	6.3	30	159	28	41	5.3
3	5	8.2	5.3	5.3	4.5	4.5	6	29	142	25	37	4.9
4	5.2	8.1	5.8	5.3	4.8	4.8	6	32	179	23	25	4.7
5	6.1	7.9	6.5	5.3	4.8	4.8	6	38	361	24	22	4.4
6	6.4	8.1	7.3	5.3	4.5	4.8	6.3	43	414	22	22	4.1
7	6.6	7.9	7.8	5.3	4.5	4.8	6	38	346	20	17	3.8
8	7	7.6	7.8	5	4.5	5.3	6.9	37	305	20	18	4.1
9	7	7.2	7.5	5.3	4.5	5	9.8	38	261	20	16	4.9
10	6.9	6.5	7.3	5	4.5	4.8	13	53	219	19	15	4.4
11	6.3	6.4	6.8	5	4.5	4.8	18	44	147	20	13	3.9
12	5.9	6.5	6.5	5	4.5	5	26	49	127	19	15	3.8
13	6.3	6.7	6.3	5	4.5	5	34	42	131	17	14	3.7
14	9.3	7.1	6.3	5	4.5	5	30	42	111	17	11	3.6
15	12	7.1	6.3	4.8	4.5	4.8	35	47	93	16	10	3.5
16	11	5.5	6	4.8	4.8	5	48	45	89	15	11	3.3
17	10	7.5	5.8	4.8	4.5	5.3	63	63	85	16	14	3.2
18	11	8.8	5.8	4.8	4.5	5.5	62	84	80	16	11	3.1
19	12	8	5.8	4.8	4.5	5.5	68	96	76	15	11	3
20	12	7.3	5.8	4.8	4.5	5.5	71	89	70	15	22	2.9
21	11	7.3	5.8	4.8	4.5	5.5	71	110	64	23	16	3.1
22	9.8	8	5.8	4.8	4.5	5.5	79	135	58	25	13	3.3
23	9.3	7.5	5.8	4.8	4.5	5.8	54	143	53	20	11	6.7
24	9	6.5	5.8	4.5	4.8	5.5	44	144	49	16	11	6.4
25	9.5	6.8	5.8	4.5	4.8	5.5	39	94	46	14	9.6	4.7
26	6.8	7	5.3	4.5	4.5	5.8	36	98	42	13	8.1	4.2
27	8.8	6.8	5	4.5	4.5	5.5	36	133	37	12	7.1	3.9
28	7.9	7	5	4.5	4.5	5.5	41	199	34	12	6.6	3.6
29	7.9	7	5	4.5	---	5.8	39	289	32	14	6.9	3.5
30	7.7	6.3	5	4.5	---	6	32	222	31	21	6.9	3.4
31	7.3	---	5	4.5	---	6.5	---	195	---	32	7.1	---
TOTAL	250.6	218.5	188.3	151.0	127.5	162.1	998.8	2733	4033	599	471.3	123.4
MEAN	8.08	7.28	6.07	4.87	4.55	5.23	33.3	88.2	134	19.3	15.2	4.11
AC-FT	497	433	373	300	253	322	1980	5420	8000	1190	935	245
MAX	12	8.8	7.8	5.3	4.8	6.5	79	289	414	32	41	6.7
MIN	4.7	5.5	5	4.5	4.5	4.5	6	29	31	12	6.6	2.9

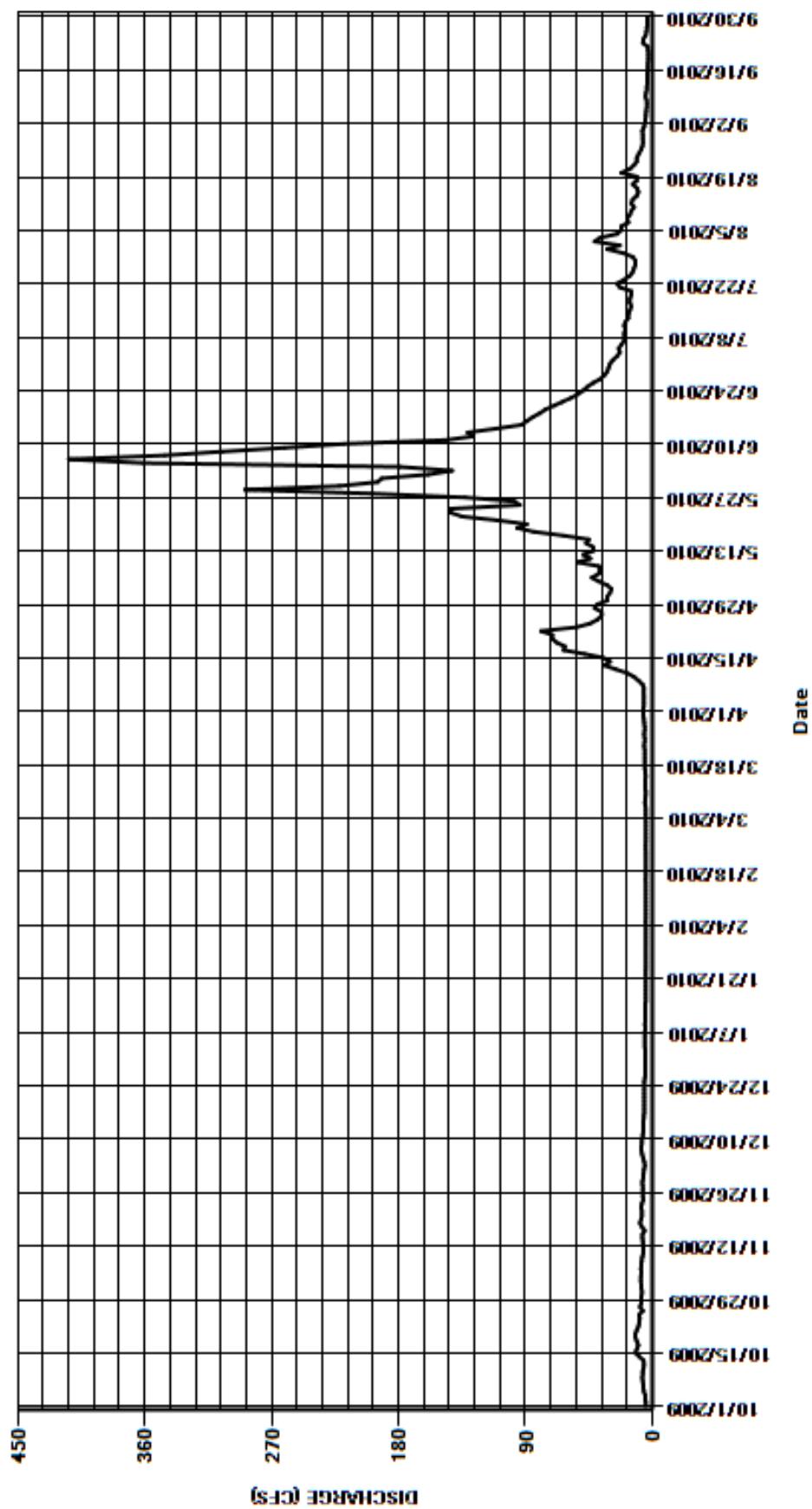
CAL YR	2009	TOTAL	14076.9	MEAN	38.6	MAX	269	MIN	3.6	AC-FT	27920
WTR YR	2010	TOTAL	10056.5	MEAN	27.6	MAX	414	MIN	2.9	AC-FT	19950

MAX DISCH: 863 CFS AT 23:45 ON Jun. 05,2010 GH 5.32 FT. SHIFT 0 FT. (GH CORR. -0.01 FT APPLIED)

MAX GH: 5.32 FT. AT 23:45 ON Jun. 05,2010 (GH CORR. -0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09078600 FRYINGPAN RIVER NEAR THOMASVILLE
Water Year 2010

Location.-- Lat. 39°20'41", Long. 106°40'23", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on right bank 400 ft upstream from private bridge, 400 ft downstream from mouth of North Fork Fryingpan River, 1.6 mi southeast of Thomasville, CO, and 1.7 mi northwest of Norrie, CO.

Drainage and Period of Record.-- 134 mi².

Equipment.-- Graphic water-stage recorder and a shaft encoder in 42-in diameter corrugated metal shelter and well. Data collection platform and satellite transmitter is a Sutron SatLink housed in external box mounted on shelter. Recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape. Stilling well is connected to stream by two 2-in diameter pipes.

Hydrologic Conditions.-- Drainage basin is almost entirely National Forest land. Transmountain diversions above station occur through Boustead Tunnel and through Busk-Ivanhoe Tunnel.

Gage-Height Record.-- The primary record is hourly averages of 15-minute satellite data with chart record used for backup. The record is complete and reliable for Water Year 2010, except for the periods Dec 9-10 when the weir was affected by ice. The periods Jun 15-17 and Jul 12-15 the intakes were partially clogged, resulting in an artificially high gage height. A flush correction was applied to data during these periods. Checks between the primary and backup records agreed to within +/- 0.02 ft. Several instrument corrections were applied during the period of record.

Datum Corrections.-- Levels were run to inside gage on Aug 25, 2009. Using RM 1 as a base, the gage was found to read correct. An RP adjustment was not required.

Rating.-- Control is a 103 ft long concrete weir. Rating No. 3 (developed Nov 18, 2008) was used for the entire Water Year 2010. The rating is well defined from 20 to 1000 cfs. Ten discharge measurements (Nos. 404-413) were made during WY 2010. Msmt 414 made subsequently was used for analysis. Measurements range from 17.6 to 212 cfs, which covered the range experienced during the year except for the higher daily flows of Apr 22; May 21-24, 26-31; and June 1-15, 18-21, 23-27 and 29-30. The peak discharge of 1550 cfs occurred at 0100 on Jun 6 at a gage height of 4.52 ft with a shift of -0.03 ft. The peak gage height exceeded high measurement 410 by 1.81 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were distributed by time for the period of record. Raw shifts ranged from 0.00 to -0.03 ft. Measurements 404, 406, 407, 412 and 413 were discounted from -2% to -4% to smooth the shift distribution.

Special Computations.-- Daily discharge for Dec 9-10 (weir affected by ice) was graphically estimated from adjacent good chart data.

Remarks.-- Record is good. Station operated and record developed by James Kellogg.

Recommendations.-- Bank-operated cableway needs a winch to aid with equipment stream crossing or should be replaced with a new design. Cableway is due for inspection.

STATE OF COLORADO
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09078600 FRYINGPAN RIVER NEAR THOMASVILLE

RATING TABLE--

FRYTHOCO03 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

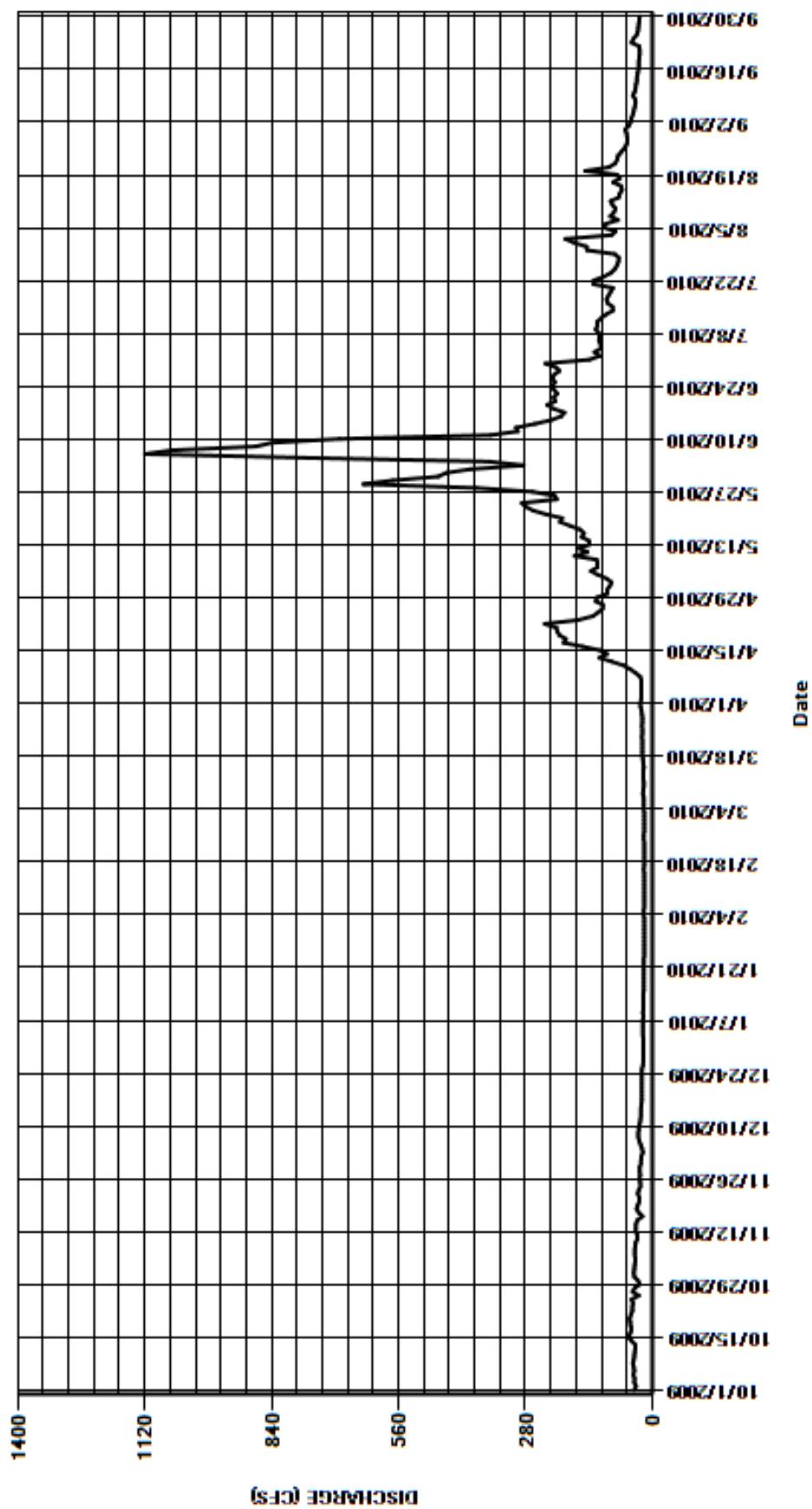
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	41	25	20	18	18	26	100	455	139	173	52
2	36	40	24	20	18	18	25	94	400	116	192	48
3	40	39	21	21	18	18	24	90	284	128	90	46
4	39	38	23	21	19	19	24	101	360	113	81	43
5	42	38	26	21	19	19	24	120	764	114	108	41
6	40	39	29	21	18	19	25	136	1120	118	103	39
7	41	39	31	21	18	19	24	121	1060	117	76	37
8	43	38	31	20	18	21	27	121	875	118	93	38
9	41	37	30	21	18	20	37	123	839	125	85	43
10	40	33	29	20	18	19	49	172	690	121	81	39
11	39	33	27	20	18	19	64	143	357	122	88	37
12	38	37	26	20	18	20	90	162	297	113	92	36
13	38	36	25	20	18	20	117	139	301	102	74	34
14	46	36	25	20	18	20	100	140	259	87	72	34
15	53	33	25	19	18	19	116	156	223	88	67	32
16	49	22	24	19	19	20	154	151	201	99	69	31
17	46	30	23	19	18	21	196	160	194	101	87	30
18	48	35	23	19	18	22	191	182	218	97	72	30
19	49	32	23	19	18	22	205	204	232	92	78	29
20	50	29	23	19	18	22	210	199	214	87	148	28
21	47	29	23	19	18	22	212	234	218	130	96	28
22	44	32	23	19	18	22	238	263	210	129	82	29
23	44	30	23	19	18	23	164	279	217	107	78	46
24	43	26	23	18	19	22	132	288	223	91	76	42
25	46	27	23	18	19	22	120	211	215	83	69	35
26	30	28	21	18	18	23	110	216	221	78	62	32
27	44	27	20	18	18	22	109	265	217	75	57	31
28	39	28	20	18	18	22	125	388	205	74	55	30
29	28	28	20	18	---	23	122	638	213	83	56	29
30	32	25	20	18	---	24	99	572	236	144	57	28
31	40	---	20	18	---	26	---	473	---	146	60	---
TOTAL	1295	985	749	601	509	646	3159	6641	11518	3337	2677	1077
MEAN	41.8	32.8	24.2	19.4	18.2	20.8	105	214	384	108	86.4	35.9
AC-FT	2570	1950	1490	1190	1010	1280	6270	13170	22850	6620	5310	2140
MAX	53	41	31	21	19	26	238	638	1120	146	192	52
MIN	28	22	20	18	18	18	24	90	194	74	55	28
CAL YR	2009	TOTAL	36535	MEAN	100	MAX	524	MIN	20	AC-FT	72470	
WTR YR	2010	TOTAL	33194	MEAN	90.9	MAX	1120	MIN	18	AC-FT	65840	

MAX DISCH: 1550 CFS AT 01:00 ON Jun. 06,2010 GH 4.52 FT. SHIFT -0.03 FT.

MAX GH: 4.52 FT. AT 01:00 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078600 FRYINGPAN RIVER NEAR THOMASVILLE
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
09080100 FRYINGPAN RIVER AT MEREDITH
Water Year 2010

Location.-- Lat. 39°21'45", Long. 106°43'55", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T.8 S., R.84 W., Eagle County, Hydrologic Unit 14010004, on left bank at Meredith, CO, 0.1 mi downstream from Waterbury Creek, 0.7 mi downstream from Jakeman Gulch.

Drainage and Period of Record.-- 191 mi².

Equipment.-- Graphic water stage recorder, a Sutron SatLink2 data collection platform (DCP), and a Model 56-0540 Sutron shaft encoder in a standard 42-in corrugated metal shelter and well. Recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape.

Hydrologic Conditions.-- Transmountain diversions above station occur through the Boustead and Busk-Ivanhoe Tunnels.

Gage-Height Record.-- The primary record is hourly averages of 15 minute satellite data with chart data used for backup. The record is complete and reliable, except for Nov 16-18, 2009 when the stage-discharge relationship was affected by anchor ice in the control, and the period of no gage height Nov 23, 2009 through May 11, 2010 when the well was frozen. Shaft encoder corrections were applied throughout the period of record.

Datum Corrections.-- Levels were run on July 10, 2009 to the RP index using R.M. 1 as base. The RP index was found to be -0.006 feet low. No corrections were made since the RP was found to be within the allowable error tolerances.

Rating.-- Low water control is a riffle approximately 80 ft. below the gage house. High water controls are channel banks. Rating 4, in use since October 1, 1984, was used all water year. It is well defined from 25 to 1000 cfs. Ten discharge measurements 425-434 were made during the water year ranging from 33.2 to 356 cfs. They cover the range experienced except for the higher daily flows of Apr 22, May 22-24, 27-31, and Jun 1-14, 19; and the lower daily flows of Nov 22-23, Dec 2-4, 27-31, Jan 1, 24-31, Feb 1-3, 6-15, 17-23, 26-28, and Mar 1-7, 10, 11, 15. The peak discharge of 1880 cfs occurred at 0215 on Jun 6, 2010 at a gage height of 5.33 ft with a shift of -0.06 ft. The peak gage height exceeded high measurement 431 by 2.22 ft in stage.

Discharge.-- Shifts were distributed by time through the entire water year. Measurements made this year indicate raw shifts ranging from -0.08 to +0.02 ft. Measurements 425, 426, 430, 432, and 433 were discounted from -6% to +3% to smooth the shift distribution.

Special Computations.-- Discharge for the period of frozen well was estimated from winter ice measurements and hydrographic comparison with hourly discharge at the FRYTHOCO Fryingpan River near Thomasville (FRYTHOCO) gage. Measurements 427-429 were made during the period of frozen well (no gage height).

Remarks.-- Record is good except for periods of no gage height, and ice on the control which are considered poor. Station maintained and record developed by Craig Bruner

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09080100 FRYINGPAN RIVER AT MEREDITH

RATING TABLE--

FRYMERCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

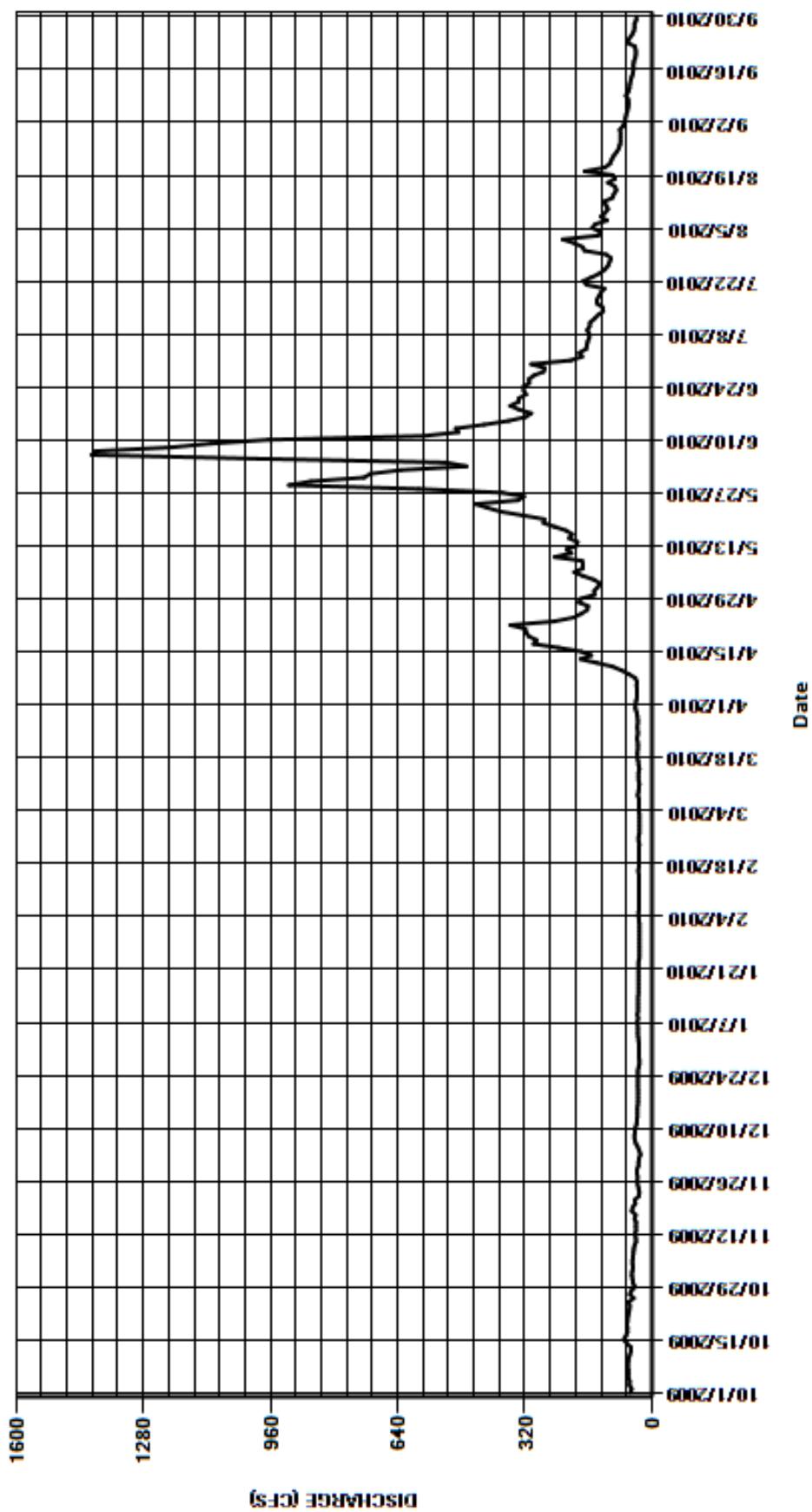
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	51	34	33	32	32	42	146	709	205	196	73
2	51	50	33	34	32	32	40	137	632	176	225	69
3	57	48	29	35	33	32	38	131	467	183	135	67
4	56	49	32	36	34	33	38	146	519	166	129	65
5	60	49	36	36	34	33	38	174	992	164	151	62
6	59	48	41	36	33	33	39	196	1410	162	143	60
7	59	47	44	37	33	33	38	174	1400	158	113	59
8	61	46	44	35	33	36	42	174	1210	158	129	60
9	60	44	43	37	33	34	58	176	1110	163	118	66
10	59	40	42	35	33	33	76	245	966	157	111	60
11	56	41	39	35	33	32	99	203	575	156	116	57
12	53	43	38	35	33	34	139	215	487	145	120	56
13	53	40	37	35	33	34	180	190	494	136	100	54
14	63	41	37	35	33	34	153	188	423	123	96	51
15	71	40	37	34	33	32	178	209	361	124	90	48
16	66	44	36	34	35	34	235	201	319	138	93	47
17	62	41	35	34	33	35	298	216	304	139	111	47
18	62	51	35	34	33	37	290	245	335	134	93	46
19	63	49	35	34	33	37	310	273	357	128	99	42
20	62	42	35	34	33	36	317	271	336	120	170	41
21	61	44	36	34	33	36	319	325	335	165	119	41
22	59	33	36	34	33	36	357	381	317	173	106	43
23	57	32	36	34	32	38	245	414	323	152	102	62
24	56	34	36	32	34	36	197	445	324	132	97	58
25	59	36	36	32	34	36	178	337	309	119	90	51
26	46	37	34	32	32	37	163	322	310	111	84	46
27	56	36	32	32	32	36	161	377	298	107	81	44
28	52	38	32	32	32	36	184	588	273	103	79	44
29	43	38	33	32	---	37	179	914	270	115	79	40
30	48	34	33	32	---	39	145	859	304	170	79	39
31	49	---	33	32	---	42	---	725	---	175	81	---
TOTAL	1774	1266	1119	1056	924	1085	4776	9597	16469	4557	3535	1598
MEAN	57.2	42.2	36.1	34.1	33	35	159	310	549	147	114	53.3
AC-FT	3520	2510	2220	2090	1830	2150	9470	19040	32670	9040	7010	3170
MAX	71	51	44	37	35	42	357	914	1410	205	225	73
MIN	43	32	29	32	32	32	38	131	270	103	79	39
CAL YR	2009	TOTAL	55862	MEAN	153	MAX	873	MIN	29	AC-FT	110800	
WTR YR	2010	TOTAL	47756	MEAN	131	MAX	1410	MIN	29	AC-FT	94720	

MAX DISCH: 1880 CFS AT 02:15 ON Jun. 06,2010 GH 5.33 FT. SHIFT -0.06 FT.

MAX GH: 5.33 FT. AT 02:15 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**09080100 FRYINGPAN RIVER AT MEREDITH
WY2010 HYDROGRAPH**



ROARING FORK RIVER BASIN
09080300 ROCKY FORK CREEK NEAR MEREDITH
Water Year 2010

Location.--	Lat. 39°21'42", Long. 106°49'12", in NW 1/4 NW 1/4 sec. 18, T.8 S., R.84 W., Pitkin County, Hydrologic Unit 14010004 on right bank at upstream end of flume constructed to carry Rocky Fork Creek across spillway to auxiliary outlet of Ruedi Dam on Fryingpan River and 4.6 mi west of Meredith, CO.
Drainage and Period of Record.--	12.3 mi ² .
Equipment.--	Graphic water-stage recorder and shaft encoder (connected to recorder wheel by chain) in 42-in diameter corrugated metal shelter and well located directly in stream above control. Shaft encoder is hard-wired to DCP in control house on Ruedi Dam, allowing satellite transmission. Satellite monitoring equipment owned and maintained by USBR. Recorder and shaft encoder are set by drop tape to an inside adjustable reference point on equipment shelf.
Hydrologic Conditions.--	Basin is entirely USFS land and there is no development or roads except for trailhead parking 1/4 mile above station. There are no diversions above station. Discharge from gage is subtracted from downstream USGS gage FRYRUDCO to calculate Ruedi Reservoir releases.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with chart record used for backup. The record is complete and reliable, except for Oct 20-23 and Aug 3-12 (backwater from beaver dams), Mar 16-22 and Apr 29 (malfunctioning shaft encoder), and Dec 3, 2009 - Mar 6, 2010 (frozen well). Chart data was utilized Mar 16-22 and Apr 29 without loss of accuracy. Checks between the primary and backup records generally agreed to within +/- 0.02 ft. A 0.01 ft instrument correction was distributed from Mar 22 through the end of the water year.
Datum Corrections.--	The tape was found 0.01 ft too long (read 0.01 ft high) during levels run on Sep 01, 2009. This error resulted in the shaft encoder being set to read 0.01 ft high. A -0.01 ft datum correction was applied from the beginning of Water Year 2010 until the tape and shaft encoder were adjusted on Oct 23, 2009.
Rating.--	Control is a 38 ft. wide v-notch, sharp crested weir adjacent to gage house. Rating 2 was used for the entire period of record and has been in place since Nov 11, 2004. Eight discharge measurements (Nos. 87-94) were made during WY 2010. These and measurement 95 made subsequently, were used for analysis. Measurements ranged from 2.11 to 13.2 cfs and covered the entire range of discharge except for the higher daily flows of May 21-31, Jun 1-30, and Jul 1; and the lower daily flows of Jan 17-31, Feb 1-28, and Mar 1-28. The peak discharge of 59.2 cfs occurred at 0000 on Jun 8, 2010 at a gage height of 1.41 ft (gage height correction of 0.01 ft applied) with a shift of 0.00 ft. The maximum gage height exceeded the stage of high measurement 93 by 0.61 ft.
Discharge.--	Shifting section control method was used for Water Year. Shifts were distributed by time. Raw shifts ranged from -0.03 ft to +0.01 ft. Measurements 91, 94, and 95 were discounted 4% to -13% to adjust the shifts to 0.00 ft. The large discount of measurement 95 is justified because stream velocities below the operating range of a pygmy meter likely resulted in under-registering discharge. Measurements 88-90 were made during the period of no gage height when the well was frozen.
Special Computations.--	Gage height during backwater from beaver dams was estimated with adjacent good shaft encoder data and checked against graphic estimates developed from chart data. Estimated daily discharge during period of frozen well were calculated as a percentage of the discharge at downstream gage on Fryingpan River below Ruedi Reservoir. No major changes were made to the release rate from the reservoir during this period.
Remarks.--	Record is rated as good, except for estimated days during backwater, which are rated as fair, and estimated days during frozen well conditions, which are rated as poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	CDWR recommends installation of a Sutron Model SDR-0001-4 stage discharge recorder to replace the existing shaft encoder. CDWR also recommends installation of a Sutron constant flow bubbler (CFB) sensor to replace the graphic recorder as the source of the backup record. The orifice for the CFB should be on the weir to provide accurate gage height readings during the winter period.

STATE OF COLORADO
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09080300 ROCKY FORK CREEK NEAR MEREDITH

RATING TABLE--

RFCMERC002 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

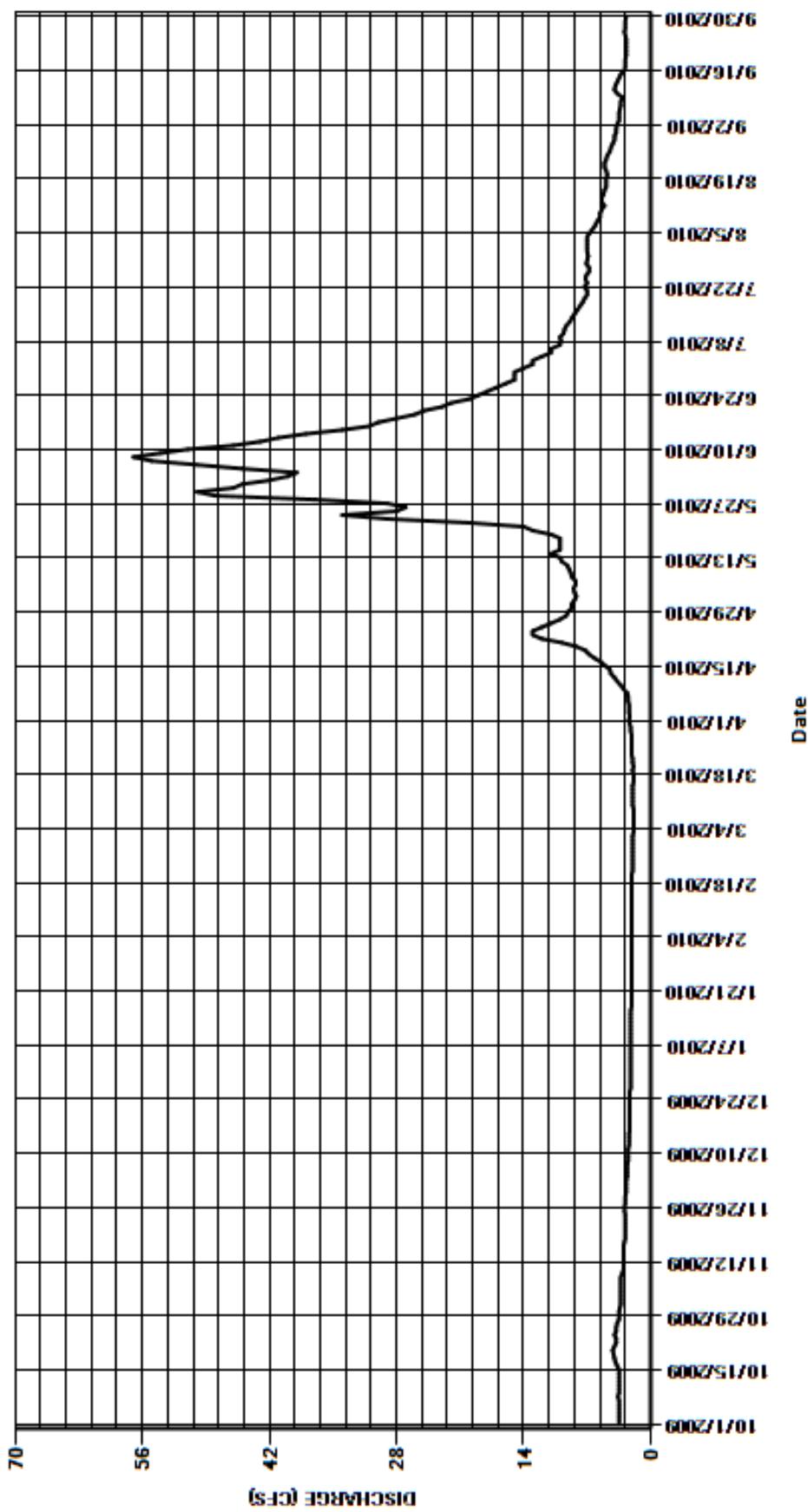
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	3.3	2.7	2.2	2.1	2	2.4	8.7	45	14	7	3.8
2	3.5	3.3	2.7	2.2	2.1	2	2.3	8.4	42	13	7	3.7
3	3.5	3.3	2.7	2.2	2.1	1.9	2.4	8.2	40	13	7	3.5
4	3.5	3.3	2.6	2.2	2.1	1.9	2.4	8.4	39	12	7	3.5
5	3.5	3.3	2.6	2.2	2.1	1.9	2.4	8.5	45	11	6.7	3.5
6	3.5	3.3	2.6	2.2	2.1	1.9	2.5	8.3	50	11	6.4	3.4
7	3.5	3.3	2.6	2.2	2.1	1.9	2.5	8.3	55	10	6.1	3.3
8	3.6	3.3	2.5	2.2	2.1	1.9	2.6	8.7	57	9.9	5.9	3.3
9	3.5	3.1	2.5	2.2	2.1	1.9	3	8.8	54	10	5.6	3.1
10	3.5	3	2.5	2.2	2.1	2	3.3	9	51	9.6	5.6	3.7
11	3.5	3	2.5	2.2	2.1	2	3.7	9.2	46	9.5	5.4	4
12	3.5	3	2.4	2.2	2.1	2	4	9.8	43	9.3	5.1	3.9
13	3.5	3	2.4	2.2	2.1	2	4.4	10	41	8.9	5.4	3.7
14	3.5	3	2.4	2.2	2.1	2	4.5	11	38	8.7	5.4	3.5
15	3.5	3	2.4	2.2	2.1	2	5	10	34	8.4	5.2	3.3
16	3.7	3	2.3	2.2	2.1	1.9	5.5	10	31	8.1	5.1	2.9
17	3.9	2.9	2.3	2.1	2.1	1.9	6.2	10	30	7.8	4.9	2.8
18	4	2.8	2.3	2.1	2.1	1.9	6.8	10	28	7.5	4.9	2.8
19	4.1	2.8	2.3	2.1	2.1	2	7.2	11	26	7.3	4.9	2.8
20	4.2	2.8	2.3	2.1	2.1	1.9	8.2	13	25	7	4.8	2.7
21	4	2.8	2.3	2.1	2	2	9.8	14	23	7	4.9	2.7
22	3.8	2.8	2.3	2.1	2	2	12	20	22	7.3	5.1	2.7
23	3.8	2.8	2.3	2.1	2	2.1	13	29	20	7	5.1	2.7
24	4	2.8	2.3	2.1	2	2.1	13	34	19	7.2	4.9	2.7
25	3.8	2.9	2.3	2.1	2	2.1	12	28	18	7.1	4.8	2.8
26	3.8	2.9	2.3	2.1	2	2.1	11	27	17	6.8	4.5	2.9
27	3.7	2.8	2.2	2.1	2	2.1	10	29	16	6.8	4.4	2.8
28	3.5	2.8	2.2	2.1	2	2.1	9.3	37	15	7.1	4.2	2.8
29	3.5	2.8	2.2	2.1	---	2.2	9.1	48	15	7	4	2.8
30	3.5	2.7	2.2	2.1	---	2.2	8.7	50	15	6.9	4	2.7
31	3.4	---	2.2	2.1	---	2.3	---	46	---	7	3.8	---
TOTAL	113.3	89.9	74.4	66.7	58.0	62.2	189.2	551.3	1000	273.2	165.1	94.8
MEAN	3.65	3	2.4	2.15	2.07	2.01	6.31	17.8	33.3	8.81	5.33	3.16
AC-FT	225	178	148	132	115	123	375	1090	1980	542	327	188
MAX	4.2	3.3	2.7	2.2	2.1	2.3	13	50	57	14	7	4
MIN	3.4	2.7	2.2	2.1	2	1.9	2.3	8.2	15	6.8	3.8	2.7

CAL YR	2009	TOTAL	4024.9	MEAN	11	MAX	71	MIN	2.2	AC-FT	7980
WTR YR	2010	TOTAL	2738.1	MEAN	7.5	MAX	57	MIN	1.9	AC-FT	5430

MAX DISCH: 59.2 CFS AT 00:00 ON Jun. 08,2010 GH 1.41 FT. SHIFT 0 FT. (GH CORR. +0.01 FT. APPLIED)
 MAX GH: 1.41 FT. AT 00:00 ON Jun. 08,2010 (GH CORR. +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080300 ROCKY FORK CREEK NEAR MEREDITH
WY2010 HYDROGRAPH



ROARING FORK RIVER BASIN
CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
Water Year 2010

Location.--	Lat 39° 22'38", long 107° 12'17" in SW1/4 NE1/4 Sec. 10, T8S, R88W in Garfield County. Located on right bank of Crystal River, at upstream side of County Road 118 bridge, and 0.75 mi. below confluence with Prince Creek.
Drainage and Period of Record.--	N/A.
Equipment.--	Sutron Constant Flow Bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The CFB orifice pipe is below the upstream side of County Road 118 bridge. The CFB is set to a wire weight gage on the upstream side of the bridge. High stage flows washed out the CFB orifice pipe. This resulted in several temporary repairs to the pipe as flows receded in subsequent weeks. The orifice pipe was partially encased in concrete on Sep 9, 2010 in an effort to remedy the problem in successive water years.
Hydrologic Conditions.--	Drainage basin is the Crystal River basin. The stream banks are moderate to steep sloping with exposed boulders along the lower portions. Control is rock and cobble channel at all stages, with channel banks becoming part of the control at higher stages. Seasonal diversions occur upstream and downstream of station.
Gage-Height Record.--	The primary record is hourly averages of 15-minute satellite data with the DCP and CFB logs used as backup. The record is complete and reliable for the 6-month period of operation except for May 27-29 (bubbler line clogged) and Jun 2-15 (bubbler pipe washed out). Several instrument corrections were made to the sensor during the period of record.
Datum Corrections.--	Levels were run on Mar 25, 2010. Using RM 1 as a base, the wire weight gage was found to read correct and no adjustment to the RP was made.
Rating.--	Rating No. 6 was used for the entire period of record (Apr 1 – Sep 30). Five discharge measurements (Nos. 24-28) made during WY 2010 were used for analysis. The measurements ranged in discharge from 66.0 cfs to 3360 cfs and cover the range of discharge experienced during the period of record, except for the lower daily flows on Aug 28-29; Sep 1-22, 29-30 and the higher daily flows on Jun 7-10. The peak instantaneous flow was undetermined because the CFB orifice pipe washed out. The peak was estimated to have occurred on Jun 8, 2011.
Discharge.--	Shifting control method was used for WY 2010. The shifts were applied by stage using variable stage-shift relationship CRYDOWCOVS2010 (based on Measurement Nos. 24-28) from Apr 1 through Sep 30. Raw shifts ranged from +0.02 to +0.21 ft. Measurements 24 and 28 were discounted +3% and +6%, respectively, to develop the variable stage-shift relationship.
Special Computations.--	Periods of estimated discharge (May 27-29 and Jun 2-15) were developed using a hydrographic comparison with the streamflow record for upstream gaging station on Crystal River above Avalanche Creek (CRYAVACO), which is operated and maintained by the USGS.
Remarks.--	Record is good except for periods of estimated daily discharge, which are poor. The peak instantaneous flow was undetermined because the CFB orifice pipe washed out. Gaging station operated and maintained and record developed by James Kellogg.
Recommendations.--	Use Total Station to survey cross-section of channel at gage and better define break-points in stage-discharge rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE

RATING TABLE--

CRYDOWCO06 USED FROM 01-Apr-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

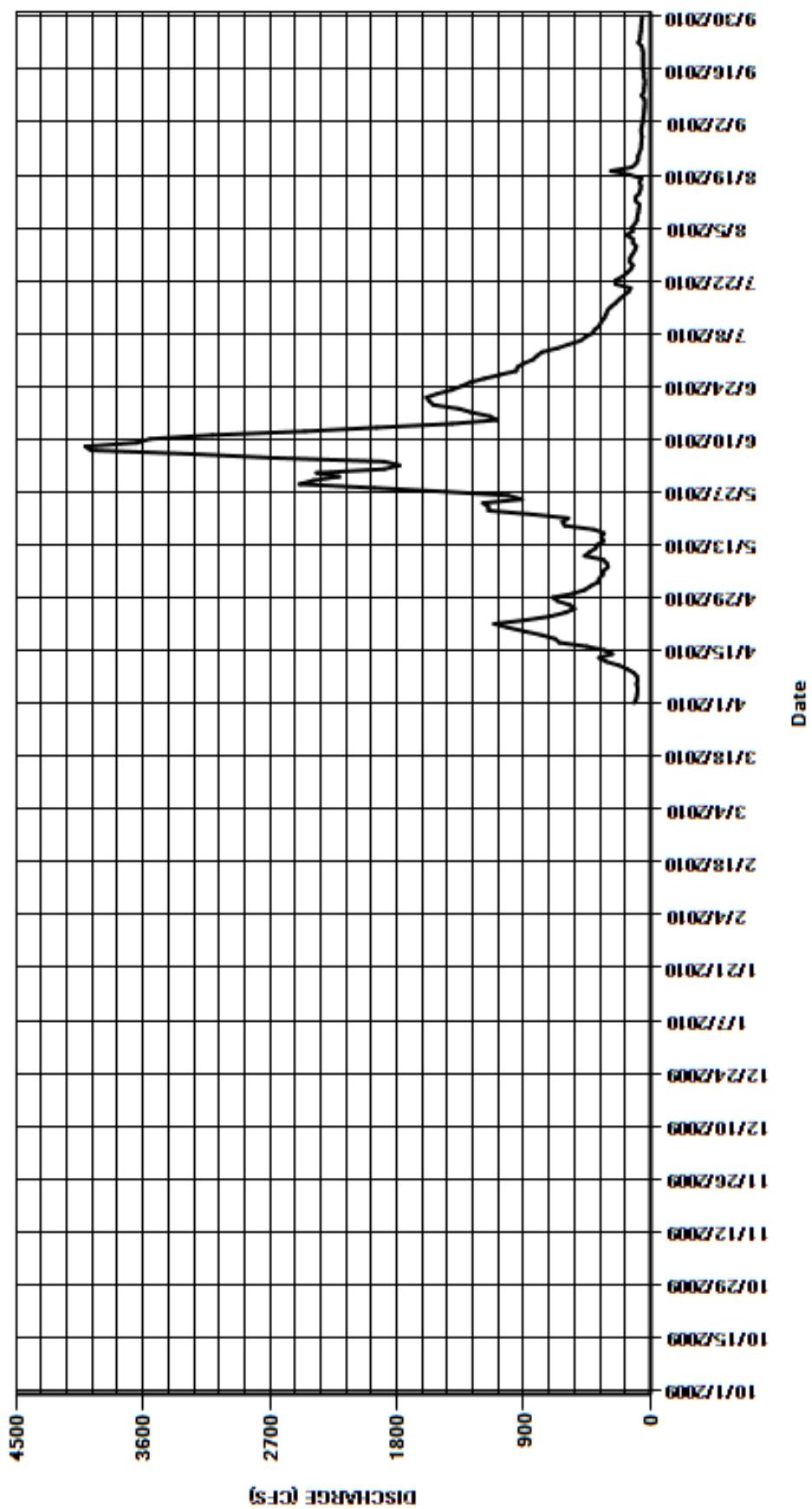
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	118	467	2370	835	127	62
2	---	---	---	---	---	---	103	426	1890	807	126	55
3	---	---	---	---	---	---	97	375	1780	770	173	53
4	---	---	---	---	---	---	94	365	1890	664	127	48
5	---	---	---	---	---	---	93	340	2690	585	133	46
6	---	---	---	---	---	---	99	336	3250	498	112	43
7	---	---	---	---	---	---	93	303	3970	462	96	41
8	---	---	---	---	---	---	96	310	4010	412	95	44
9	---	---	---	---	---	---	119	336	3640	396	87	64
10	---	---	---	---	---	---	165	468	3550	363	84	48
11	---	---	---	---	---	---	226	433	3110	351	78	47
12	---	---	---	---	---	---	316	392	2450	329	105	42
13	---	---	---	---	---	---	366	375	1940	316	108	41
14	---	---	---	---	---	---	271	334	1410	307	82	49
15	---	---	---	---	---	---	326	351	1090	282	73	46
16	---	---	---	---	---	---	452	331	1140	249	69	56
17	---	---	---	---	---	---	647	403	1270	223	78	54
18	---	---	---	---	---	---	675	609	1360	190	66	55
19	---	---	---	---	---	---	771	625	1540	157	148	55
20	---	---	---	---	---	---	893	584	1570	143	281	52
21	---	---	---	---	---	---	1010	837	1590	248	132	57
22	---	---	---	---	---	---	1110	1150	1510	249	102	63
23	---	---	---	---	---	---	885	1150	1410	200	89	88
24	---	---	---	---	---	---	709	1190	1340	168	89	75
25	---	---	---	---	---	---	603	912	1280	140	77	74
26	---	---	---	---	---	---	540	1010	1180	126	69	69
27	---	---	---	---	---	---	574	1450	1070	149	67	67
28	---	---	---	---	---	---	659	1960	954	145	65	66
29	---	---	---	---	---	---	692	2490	945	128	61	63
30	---	---	---	---	---	---	552	2390	902	112	66	59
31	---	---	---	---	---	---	---	2210	---	103	67	---
TOTAL	---	---	---	---	---	---	13354	24912	58101	10107	3132	1682
MEAN	---	---	---	---	---	---	445	804	1937	326	101	56.1
AC-FT	---	---	---	---	---	---	26490	49410	115200	20050	6210	3340
MAX	---	---	---	---	---	---	1110	2490	4010	835	281	88
MIN	---	---	---	---	---	---	93	303	902	103	61	41
CAL YR	2009	TOTAL	152273.3	MEAN	832	MAX	2850	MIN	9.6	AC-FT	302000 (PARTIAL YEAR RECORD)	
WTR YR	2010	TOTAL	111288	MEAN	608	MAX	4010	MIN	41	AC-FT	220700 (PARTIAL YEAR RECORD)	

MAX DISCH: (NOT DETERMINED)

MAX GH: FT. (NOT DETERMINED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
WY2010 HYDROGRAPH



09089500 WEST DIVIDE CREEK NEAR RAVEN

Water Year 2010

Location.--	Lat 39° 19'52", long 107° 34'46" in NE1/4 SW1/4 Sec. 29, T8S, R9W, Hydrologic Unit 14010004 in Mesa County. Station is on left bank about 5 ft downstream of private road bridge, 0.8 mi upstream of Brook Creek, 8 mi south of Raven, and 16 mi south of Silt.
Drainage and Period of Record.--	64.6 sq mi. October 1955 to September 1999. Beginning October 1999, station operated seasonally by USGS. Seasonal operation of gage by Colorado Division of Water Resources began in November 2005. Gage at same site and datum since establishment.
Equipment.--	Sutron constant flow bubbler (CFB) sensor in corrugated metal shelter on 42-in diameter stilling well. Data collection platform (DCP) is a Sutron SatLink 2 in external box. The CFB is referenced to an outside cantilever chain gage. A Sutron Model 0001-1 stage discharge recorder (SDR) provides backup data when the well intake pipes are not isolated from the stream during low stages. The SDR is set by drop tape from an inside reference point on the equipment shelf.
Hydrologic Conditions.--	Streambed is composed of boulders, cobble, and gravel. Banks are moderately steep and not usually subject to overflow. The left abutment of bridge adjacent to gage constricts flow into the right side of the channel immediately above gage. Record includes water imported from Thompson Creek (Roaring Fork Basin), Clear Fork (Muddy Creek Basin), and Owens Creek (Plateau Creek Basin).
Gage-Height Record.--	The primary record is hourly averages of 15-minute data downloaded from the CFB with the SDR and DCP logs used as backup. The record is complete and reliable for the six month period of operation (Apr 1 – Sep 30), except Apr 1-3, 6-7 and 11 when ice affected gage height readings. Several instrument calibration corrections were made to the CFB and SDR during the period of record and are documented in the station visit log. From Apr 1-21, the instrument calibration corrections include a -0.01 ft datum correction to compensate for the RP, which was determined to read high during levels run on April 21, 2010.
Datum Corrections.--	Levels were run to the inside and outside reference points (RPs) on Apr 21, 2010. Using RM 4 as a base, the outside cantilever chain gage (R.P. for the CFB) was determined to read 0.02 ft high. The cantilever chain gage was only adjusted by -0.01 ft because the chain links prevented the full -0.02 ft adjustment. Regardless of this discrepancy, future gage heights read from the outside cantilever chain gage will be deemed as correct. A -0.01 ft datum correction was applied to gage height readings from April 1 until the outside RP was adjusted at 1300 on April 21. The inside RP was found to read correct and no adjustments were made. During future level runs, reference points will not be adjusted unless discrepancy is greater than 0.02 ft.
Rating.--	The control for low and medium stages is a boulder and cobble riffle 15 ft downstream. Control for higher stages is the channel with boulders having some effect. Rating No. 16 was used for the entire period of record (Apr 1-Sep 30) during Water Year 2010. Four discharge measurements (27 –30) were made during WY 2010. Measurements ranged in discharge from 0.38 to 135 cfs and cover the range of discharge experienced except for the lower daily flows of Jul 16-27, 29-31; Aug 1, 5–31; and Sep 1–30 and the higher average daily flows of Apr 20-22, 29; May 9-12, 18-31; and Jun 1-2, 5–12. The peak discharge of 206 cfs occurred at 0130 on Jun 7, 2010 at a gage height of 3.41 ft (gage height corr.of +0.01 ft applied) with a shift of +0.06 ft. The maximum gage height exceeded the stage of high measurement 27 by 0.34 ft.
Discharge.--	Shifting control method was used during WY2010. The shifts were distributed by time for the entire six month period. Measurement 30 was determined to be poor quality and not used for development of the WY2010 record. Raw shifts for measurements 27-29 ranged from +0.05 ft to +0.06 ft and the measurements were not discounted.
Special Computations.--	Discharge for days with ice affected gage heights were estimated by comparison with adjacent good gage height data and calculated discharges.
Remarks.--	Record is rated as good except days with compromised gage height which are rated as fair. Station was maintained by Craig Bruner and record was developed by James Kellogg.
Recommendations.--	Run levels in late March, prior to period of station operation, and attempt to determine gage heights where breakpoints in stage-discharge rating may occur.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09089500 WEST DIVIDE CREEK NEAR RAVEN

RATING TABLE--

WSDRAVCO16 USED FROM 01-Apr-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

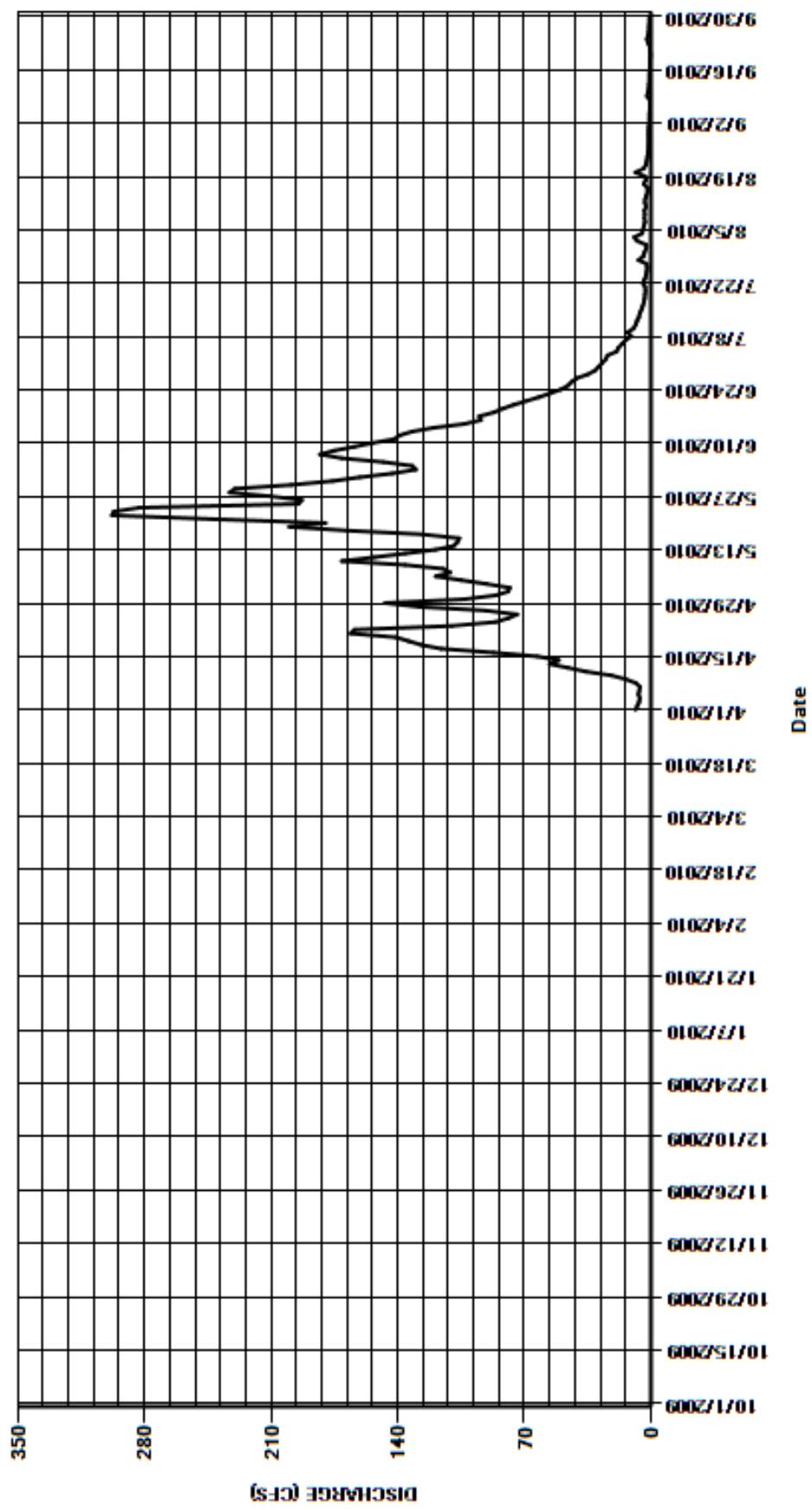
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	8.6	86	161	27	2.6	1.2
2	---	---	---	---	---	---	7.6	79	143	25	7.6	1
3	---	---	---	---	---	---	6.6	78	130	24	9.3	0.92
4	---	---	---	---	---	---	6.2	91	132	19	4.9	0.84
5	---	---	---	---	---	---	6.9	105	148	18	4.4	0.72
6	---	---	---	---	---	---	6.5	119	171	16	3.9	0.62
7	---	---	---	---	---	---	6.1	111	183	14	3.3	0.57
8	---	---	---	---	---	---	8.4	115	175	11	3.6	0.77
9	---	---	---	---	---	---	14	136	164	13	3.4	2.2
10	---	---	---	---	---	---	22	171	154	9.8	3.6	1.7
11	---	---	---	---	---	---	36	153	142	8.5	2.7	1.3
12	---	---	---	---	---	---	46	136	139	7.8	3.3	1.1
13	---	---	---	---	---	---	56	119	132	6.7	3.2	0.97
14	---	---	---	---	---	---	51	109	120	6.2	2.5	0.89
15	---	---	---	---	---	---	63	107	103	5.3	1.9	0.79
16	---	---	---	---	---	---	87	106	94	4.5	2	0.68
17	---	---	---	---	---	---	116	126	95	3.9	4.1	0.65
18	---	---	---	---	---	---	127	168	87	3.5	2.8	0.56
19	---	---	---	---	---	---	134	200	82	3.3	3.4	0.46
20	---	---	---	---	---	---	141	180	76	3.1	8.6	0.42
21	---	---	---	---	---	---	166	242	69	3.3	4.1	0.52
22	---	---	---	---	---	---	164	298	62	4.5	2.8	0.57
23	---	---	---	---	---	---	110	297	56	3.4	2.4	1.7
24	---	---	---	---	---	---	86	283	50	2.8	2	2.2
25	---	---	---	---	---	---	79	195	46	2.4	1.7	1.6
26	---	---	---	---	---	---	74	193	44	2.1	1.5	1.3
27	---	---	---	---	---	---	91	210	41	2.4	1.4	1.1
28	---	---	---	---	---	---	128	233	35	6.9	1.3	1
29	---	---	---	---	---	---	147	230	31	4.2	1.3	0.97
30	---	---	---	---	---	---	103	199	29	3.6	1.3	0.83
31	---	---	---	---	---	---	---	176	---	2.7	1.4	---
TOTAL	---	---	---	---	---	---	2097.9	5051	3094	267.9	102.3	30.15
MEAN	---	---	---	---	---	---	69.9	163	103	8.64	3.3	1
AC-FT	---	---	---	---	---	---	4160	10020	6140	531	203	60
MAX	---	---	---	---	---	---	166	298	183	27	9.3	2.2
MIN	---	---	---	---	---	---	6.1	78	29	2.1	1.3	0.42
CAL YR	2009	TOTAL	13264.15	MEAN	72.5	MAX	324	MIN	0.69	AC-FT	26310	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	10643.25	MEAN	58.2	MAX	298	MIN	0.42	AC-FT	21110	(PARTIAL YEAR RECORD)

MAX DISCH: 206 CFS AT 01:30 ON Jun. 07,2010 GH 3.41 FT. SHIFT 0.06 FT. (GH CORR. +0.01 FT APPLIED)

MAX GH: 3.41 FT. AT 01:30 ON Jun. 07,2010 (GH CORR. +0.01 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09089500 WEST DIVIDE CREEK NEAR RAVEN
WY2010 HYDROGRAPH



NORTH PLATTE RIVER BASIN
MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
Water Year 2010

Location.--	Lat. 40°36'48", Long. 106°05'05", (Gould, Colorado Quadrangle, 1955), SE1/4 of the SE1/4 in Section 36 T8N, R78W in Jackson County. Under bridge on County Road 30 about 700 feet upstream of its confluence with Peterson Creek.
Drainage and Period of Record.--	Approximately 99 sq. mi. Formerly known as the Michigan River near Gould station and was relocated due to removal of bridge. Station has been in operation at present location since 1997.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a gray NEMA box on the same side of the river but on the upstream side of the bridge. The outside staff, with a range of 0.00 to 6.66 feet, is the primary reference gage. It is located on the right bridge abutment just to the left of the stilling well.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is moderate and has moderate sinuosity. The bed material ranges from silt up to small rock approximately 6-inches in diameter. Meadow Creek Reservoir and several major diversions, located upstream of the gage, can impact flow at the gage.
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the DCP log as backup. Continuous gage height records were kept from October 1 to November 2, 2009 and April 21 to September 30, 2010. Record was not kept during the winter period. The record is complete and reliable except for the following dates: November 2, 2009 (shut-down), April 21, 2010 (start-up), and September 8-13 (affected by beaver dam). Gage height datum corrections (ranging from -0.02 feet to -0.03 feet) were made at the time of site visits. A beaver dam was removed on September 13, 2010 and the gage height changed -0.16 ft. A datum correction of -0.16 ft was applied to the record to account for the backwater effects of the dam.
Datum Corrections.--	Levels were run to a reference point (RM4) on the outside staff gage on August 25, 2010 using RM1 as base. The elevations of RM2, RM3, and RM4 (RP) and the water surface were all found to be 0.07 ft low. This discrepancy is attributed to the apparent heaving of RM1 by +0.07 ft, the base reference mark used for this survey. If the elevation of RM1 is adjusted +0.07 ft above the given elevation, then all other reference marks are found to be within 0.006 ft of their given elevations. The elevation of RM1 was corrected to 9.652 ft. No other corrections were made. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 24, 2010
Rating.--	There is no man-made control at this site. The control is a rocky channel. Rating No. 6, developed on February 21, 2006 and expanded on June 11, 2007, was used for WY2010. It is well defined to 894 cfs, 150% of the historical highest measurement made in water year 2003. Six measurements (numbers 83 through 88), ranging in discharge from 9.91 cfs to 338 cfs, were made in the record period. Measurements covered the range in stage, except for the lower mean daily flows on October 2-14, 17-20, 22-27, 2009, and August 25 – September 30, 2010; and the higher mean daily flows on May 23 – 24, and May 28 – June 16, 2010. The instantaneous peak flow of 705 cfs occurred at 0745 on June 13, 2010 at a gage height of 3.92 feet and a shift of 0.01 feet and exceeded Measurement 85, made on May 27, 2010 by 1.11 ft. in stage. The minimum daily flow of 3.3 cfs occurred on September 19, 2010.
Discharge.--	Shifting control method was applied throughout WY2010. Shifts were distributed by stage from 00:00 October 1, 2009 to the peak gage height at 07:45 on June 13, 2010 using variable stage-shift relationship SC1, which is based on measurements 74 – 86; and from 09:00 June 13 to 23:55 September 30, 2010 using variable stage-shift relationship SC2, based on measurements 86 – 90 (measurements 89 and 90 were taken in WY2011). Open-water measurements showed shifts varying between -0.15 and +0.04 feet. Shifts were applied directly and given full weight, except for Measurements 86, 89, and 90 which were discounted 5%, 3%, and -3% respectively to smooth shift distribution. Shifts (after discounting) ranged from -0.14 to +0.01 feet.
Special Computations.--	Discharge was computed for shut-down and start-up days based on actual partial day DCP data. Discharge values were estimated by use of field gage height readings and/or interpolation between spot values and previous and subsequent periods of good record.
Remarks.--	The record is good, except for the following dates: November 2, 2009 (shut-down), April 21, 2010 (start-up), which is considered fair to poor; September 9-13, 2010 (affected by beaver dam), which is considered fair. Station maintained and record developed by Jean Ray, Tom Ley and Dan Meyer.
Recommendations.--	The effects of WY 2011 runoff on the control should be evaluated to determine potential revisions to Rating No. 6. Levels should be repeated in WY2011 to continue evaluation of RM movement.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR

RATING TABLE--

MICMERCO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	27	---	---	---	---	---	66	440	61	38	7.6
2	9.8	e25	---	---	---	---	---	63	384	73	38	7
3	9.6	---	---	---	---	---	---	61	370	74	37	6.7
4	6.1	---	---	---	---	---	---	70	400	54	37	6.2
5	5.6	---	---	---	---	---	---	82	525	46	39	5.9
6	5.4	---	---	---	---	---	---	100	591	47	36	4.5
7	5.1	---	---	---	---	---	---	82	626	73	35	4
8	5.4	---	---	---	---	---	---	77	648	109	32	e5
9	5.9	---	---	---	---	---	---	81	616	75	31	e6.9
10	6.4	---	---	---	---	---	---	103	593	55	28	e5.3
11	6.5	---	---	---	---	---	---	83	593	50	25	e5
12	7.1	---	---	---	---	---	---	90	599	48	24	e6.1
13	7.5	---	---	---	---	---	---	97	655	55	25	e5.3
14	9.4	---	---	---	---	---	---	112	541	52	20	5.3
15	12	---	---	---	---	---	---	153	406	48	17	4.6
16	12	---	---	---	---	---	---	113	347	42	16	4.1
17	8.8	---	---	---	---	---	---	120	305	56	17	3.7
18	8.4	---	---	---	---	---	---	179	280	53	15	3.3
19	8.1	---	---	---	---	---	---	203	263	50	15	3
20	9.2	---	---	---	---	---	---	210	244	51	17	3.1
21	10	---	---	---	---	---	e78	275	223	51	15	3.7
22	8.1	---	---	---	---	---	105	303	194	63	12	4.1
23	7.4	---	---	---	---	---	78	374	169	64	11	5.9
24	8.3	---	---	---	---	---	72	406	156	50	10	6.5
25	9.9	---	---	---	---	---	73	278	135	45	9.7	6
26	5.9	---	---	---	---	---	66	243	131	44	8.6	5.6
27	7.8	---	---	---	---	---	67	313	126	42	8.1	4.9
28	15	---	---	---	---	---	90	371	102	46	7.8	4.5
29	23	---	---	---	---	---	92	531	83	45	9.2	4.6
30	21	---	---	---	---	---	75	493	62	56	8.1	4.3
31	26	---	---	---	---	---	---	460	---	44	8	---
TOTAL	301.7	52	---	---	---	---	796	6192	10807	1722	649.5	152.7
MEAN	9.73	26	---	---	---	---	79.6	200	360	55.5	21	5.09
AC-FT	598	103	---	---	---	---	1580	12280	21440	3420	1290	303
MAX	26	27	---	---	---	---	105	531	655	109	39	7.6
MIN	5.1	25	---	---	---	---	66	61	62	42	7.8	3

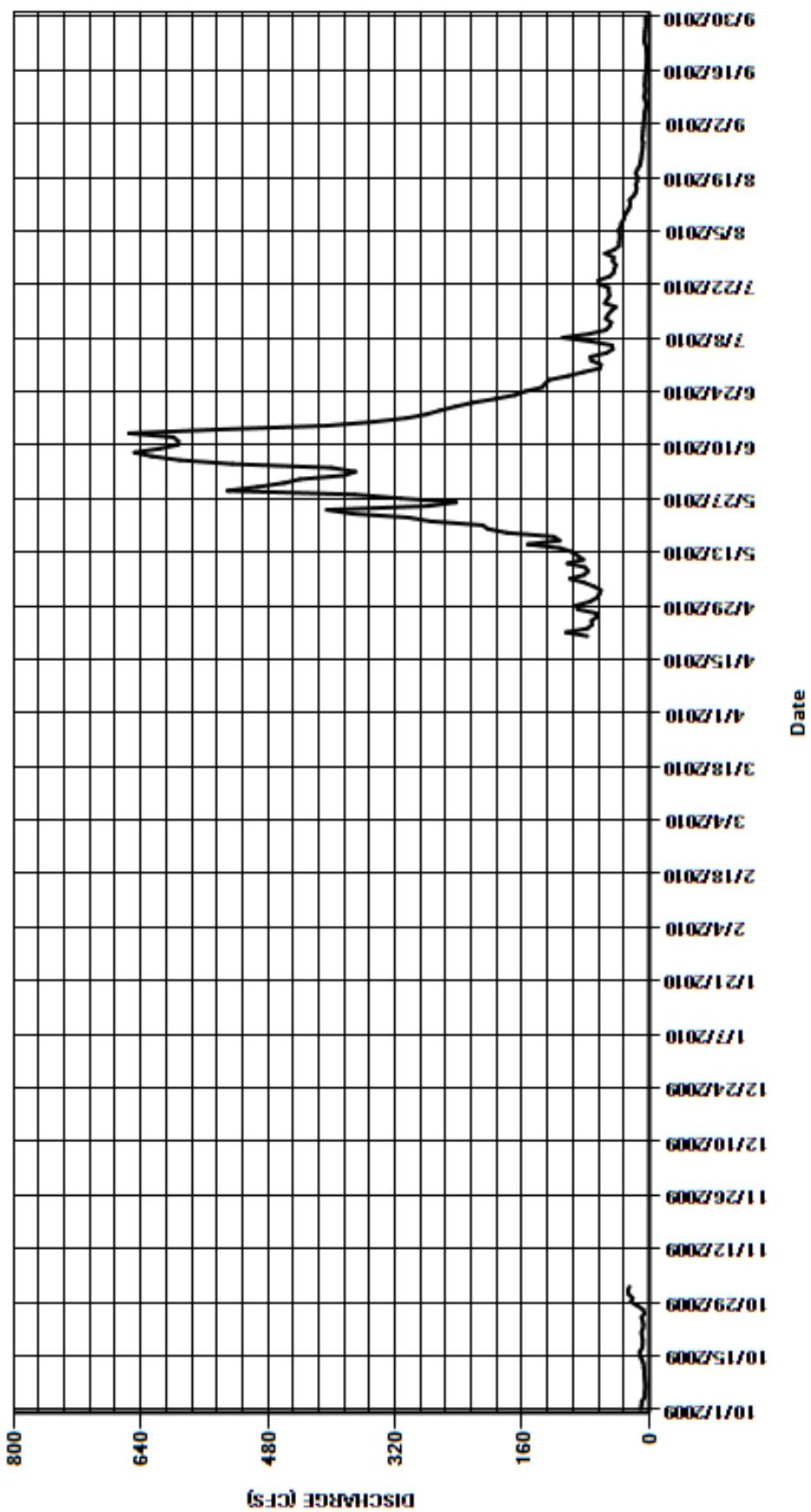
CAL YR	2009	TOTAL	17403.4	MEAN	82.9	MAX	377	MIN	5.1	AC-FT	34520	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	20672.9	MEAN	105	MAX	655	MIN	3	AC-FT	41000	(PARTIAL YEAR RECORD)

MAX DISCH: 705 CFS AT 07:45 ON Jun. 13,2010 GH 3.92 FT. SHIFT 0.01 FT.

MAX GH: 3.92 FT. AT 07:45 ON Jun. 13,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
WY2010 HYDROGRAPH



NORTH PLATTE RIVER BASIN
06617100 MICHIGAN RIVER AT WALDEN, CO.
Water Year 2010

Location.--	Lat. 40 44'27", Long. 106 16'54", (Walden, Colorado Quadrangle, 1955), NW1/4 of the NW1/4 in Section 21 T9N, R79W in Jackson County. On Jackson County property immediately upstream of the State Highway 125 Bridge crossing the Michigan River.
Drainage and Period of Record.--	Approximately 182 sq. mi. Originally established by the USGS at a location believed to be just upstream of the present location in May 1904. Records kept by the USGS from May 1904 to October 1905 and May 1923 to October 1947. Re-established by the State Engineer's Office in May 2002. Records kept by the Town of Walden from 1916 to present.
Equipment.--	The equipment at this site consists of a Sutron shaft encoder Model SE5600-0531 and high data rate Data Collection Platform (DCP) with satellite telemetry housed in a structure mounted on top of a 24-inch diameter corrugated metal pipe stilling well with two two-inch diameter inlet pipes. An electric drop tape is the primary reference gage.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is mild and has moderate sinuosity. The channel is composed of small rock, gravel, and sand. Flow is affected by upstream reservoir releases, diversions, and the Walden water plant.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log as backup. Continuous gage height records were kept from October 1, 2009 to November 2, 2009 and May 5, 2010 through September 30, 2010. Record was not kept during the winter period. The record is complete and reliable except for the following dates: November 2, 2009 (shut-down); May 5, 2010 (start-up); October 26 – November 1, 2009 (affected by ice); and June 16-21, 2010 (float malfunction). An attempt was made to open the site on April 21, 2010 but due to ice in the stilling well, actual start-up was delayed until May 5, 2010. Insufficient data were available to estimate flow between April 21 and May 4, 2010.
Datum Corrections.--	Levels were run to the electric tape index on the instrument shelf on August 25, 2010 using BM1 as base. The ET index elevation was found to be 0.019 ft higher than the given elevation, and both RM1 and RM2 were found to be more than +/- 0.02 ft different than their given elevations, however, only one shot was made on RM1. No corrections were made. The gage is potentially moving. Levels should be run annually until the highway bridge is replaced and the gage rebuilt to document movement. Tape length was measured as 7.275 ft, within 0.002 ft of the given index elevation. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 24, 2010.
Rating.--	The control at extreme high discharges is the Highway 125 Bridge. For lower flows, the control is a natural rock riffle located just downstream of the bridge. Rating No. 13, dated November 25 2009, was used the entire period of record for WY 2010. It is well defined to flows of 273 cfs, 150% of the historical highest discharge measurement made in WY2005. Six measurements (numbers 82 through 87), ranging in discharge from 4.72 cfs to 96.0 cfs, were taken during the record period. These measurements covered the range in discharge except for higher daily flows on May 13-17, May 20 – June 22, July 4, and July 8-10, 2010. The instantaneous peak flow of 948 cfs occurred at 0915 on June 14, 2010 at a gage height of 4.33 feet and a shift of -0.02 ft. It exceeded Measurement No. 83, made on April 21, 2010 by approximately 2.75 ft. in stage (gage height estimated from rating table). The minimum daily flow of 4.7 cfs occurred on September 8, 2010.
Discharge.--	Shifting control method was applied throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. Discharge measurements showed raw shifts ranging between -0.03 and 0.00 feet. Measurement number 87 was discounted -6% to smooth shift distribution.
Special Computations.--	The station is closed during the winter months and discharge is not estimated during this period. Discharge was estimated for November 2, 2009 (shut-down) based on partial day transmitted data and measurement 82. Flows for October 26 - November 1, 2009 (affected by ice) were estimated based on the transmitted hourly gage height data and consideration of temperature and precipitation data from the Colorado Climate Center (Walden, CO) as well as use of flow measurement 82 along with interpolation from days unaffected by ice during October 2009. May 5, 2010 discharge was estimated by averaging the hourly gage height data transmitted after ice in the stilling well melted and the float became functional. Discharge from June 16-21, 2010 was estimated by interpolation between the discharge on June 15 and the discharge on June 22, 2010.
Remarks.--	The record is good except for the following: the periods: May 25 and May 30 - June 18, 2010 when flows exceeded 150% of the maximum measured discharge (273 cfs) at the gage. Discharge during this period should be considered poor. This includes the peak instantaneous discharge of 948 cfs, which should also be considered poor. October 26 - November 1, 2009 (affected by ice); the estimated days of November 2, 2009 (shut-down), May 5, 2010 (ice melt in stilling well), and June 16-21, 2010 (float malfunction) Discharge on these days should be considered fair. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.
Recommendations.--	The bridge by the gage station should not be used for bridge measurements due to narrow width and heavy vehicle traffic. CDOT plans to solicit bids for replacing the bridge in February 2011 with construction tentatively scheduled following spring runoff. The existing gaging station will be removed and a replacement constructed at the time of bridge replacement. There is currently no means of making high flow measurements at this site.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06617100 MICHIGAN RIVER AT WALDEN, CO.

RATING TABLE--

MICWLDCO13 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	e30	---	---	---	---	---	---	428	42	42	10
2	13	e32	---	---	---	---	---	---	409	59	46	9.3
3	13	---	---	---	---	---	---	---	354	80	47	7.3
4	12	---	---	---	---	---	---	---	329	97	48	6.3
5	14	---	---	---	---	---	---	e61	334	94	55	5.5
6	12	---	---	---	---	---	---	58	453	82	49	5
7	11	---	---	---	---	---	---	74	566	78	44	5.2
8	12	---	---	---	---	---	---	63	636	103	41	4.7
9	12	---	---	---	---	---	---	49	691	108	39	5.4
10	14	---	---	---	---	---	---	49	704	100	36	5.9
11	15	---	---	---	---	---	---	54	648	84	31	6
12	15	---	---	---	---	---	---	80	719	71	28	5.1
13	14	---	---	---	---	---	---	110	878	62	26	4.8
14	14	---	---	---	---	---	---	117	909	55	25	6.9
15	14	---	---	---	---	---	---	156	720	61	22	8.8
16	14	---	---	---	---	---	---	184	e539	55	21	8.4
17	14	---	---	---	---	---	---	109	e436	45	21	8.1
18	14	---	---	---	---	---	---	80	e349	53	20	8.2
19	14	---	---	---	---	---	---	79	e272	51	19	8.3
20	13	---	---	---	---	---	---	105	e204	49	22	8.4
21	14	---	---	---	---	---	---	126	e145	48	21	8.3
22	13	---	---	---	---	---	---	147	118	54	18	8.6
23	14	---	---	---	---	---	---	183	92	59	15	9.7
24	14	---	---	---	---	---	---	271	75	54	14	9.5
25	14	---	---	---	---	---	---	351	66	44	13	8.9
26	e14	---	---	---	---	---	---	192	67	40	12	9
27	e14	---	---	---	---	---	---	160	70	38	11	8.5
28	e15	---	---	---	---	---	---	157	60	40	10	8
29	e18	---	---	---	---	---	---	212	55	45	11	8.4
30	e23	---	---	---	---	---	---	391	47	55	11	9
31	e25	---	---	---	---	---	---	456	---	53	11	---
TOTAL	446	62	---	---	---	---	---	4074	11373	1959	829	225.5
MEAN	14.4	31	---	---	---	---	---	151	379	63.2	26.7	7.52
AC-FT	885	123	---	---	---	---	---	8080	22560	3890	1640	447
MAX	25	32	---	---	---	---	---	456	909	108	55	10
MIN	11	30	---	---	---	---	---	49	47	38	10	4.7

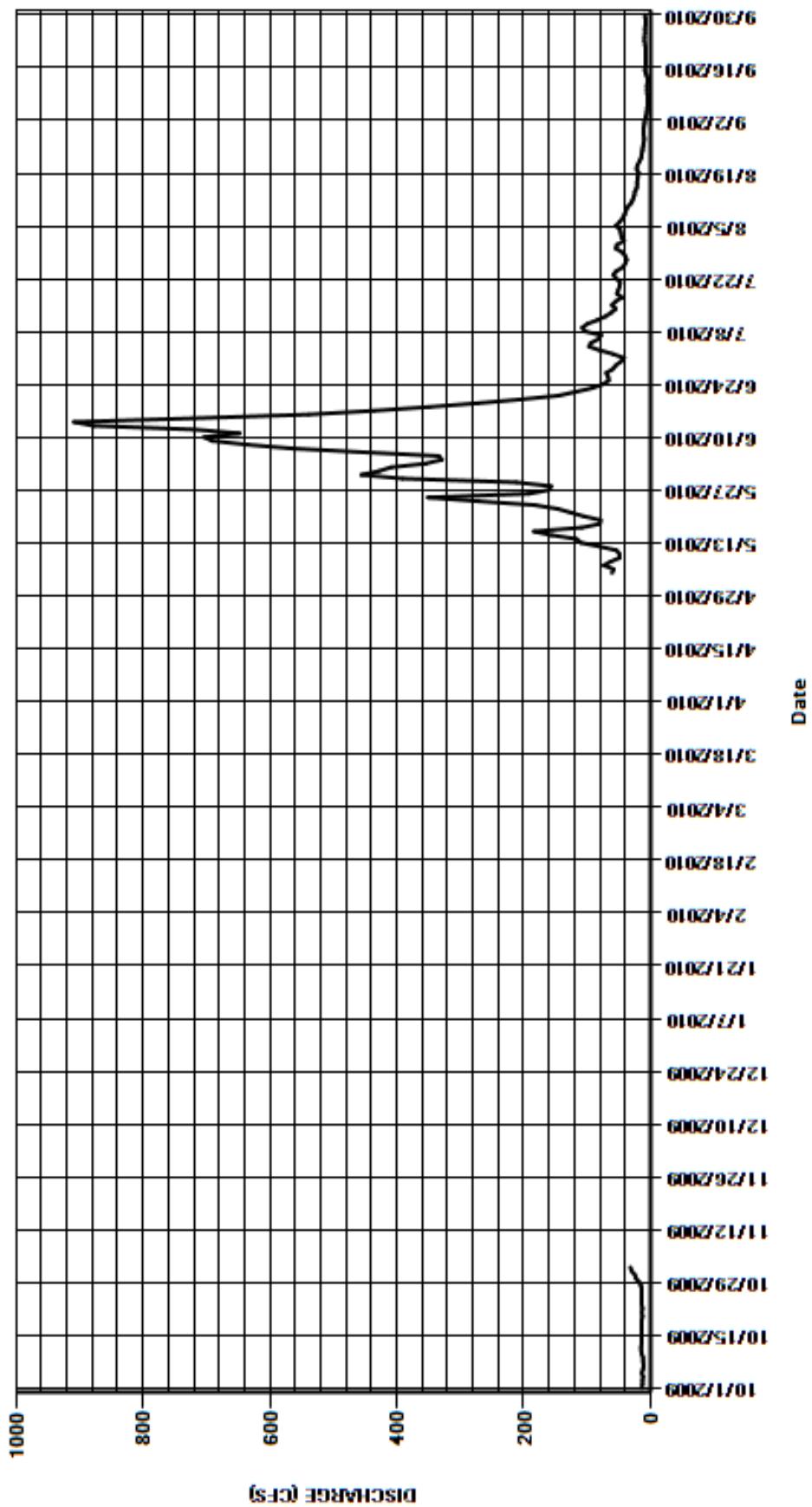
CAL YR	2009	TOTAL	11941.9	MEAN	62.9	MAX	340	MIN	4.4	AC-FT	23690	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	18968.5	MEAN	104	MAX	909	MIN	4.7	AC-FT	37620	(PARTIAL YEAR RECORD)

MAX DISCH: 948 CFS AT 09:15 ON Jun. 14,2010 GH 4.33 FT. SHIFT -0.02 FT.

MAX GH: 4.33 FT. AT 09:15 ON Jun. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617100 MICHIGAN RIVER AT WALDEN, CO.
WY2010 HYDROGRAPH



NORTH PLATTE RIVER BASIN
06617500 ILLINOIS RIVER NEAR RAND
Water Year 2010

Location.--	Lat. 40°27'45", Long. 106°10'30", (Rand Quadrangle, 1956), in SW1/4 of the NE1/4 of Section 29, T6N, R78W in Jackson County, on right upstream bridge abutment on Jackson County Road 27.
Drainage and Period of Record.--	Approximately 70.6 sq. mi. (from topographic maps). Established by the State Engineer's Office. Formerly published as Illinois Creek near Rand (1931-1940) at similar location. Hydrographic measurements taken in 1981 and 1985, but no records were kept. Records kept from 1987 to present. Records published in 1995 and 2002 through the present.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located several feet back from the channel bank in a gray housing box. Primary reference is an outside staff gage, with a range of 0.00 to 4.33 feet, located on the bridge abutment just to the left of the well. Altitude of gage is approximately 8550 ft (from topographic map).
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up at the Continental Divide. In the vicinity of the gage station, the channel slope is moderate, but has a high sinuosity. The bed material ranges from silt up to small rock approximately 4-inches in diameter.
Gage-Height Record.--	Primary record is hourly averages of 15-minute transmitted data with DCP log as backup.. Continuous record was kept from October 1 to November 2, 2009 and April 21 to September 30, 2010. Due to weather constraints, the gage station is closed in the winter months. The gage station was visited on 6 separate occasions to ensure the instruments remained calibrated. A flush correction of -0.12 feet was made on July 27, 2010. The shaft encoder float was found beached on mud in the stilling well on July 27, 2010. The stilling well was flushed to remove the sediment, and a gage height change of -0.12 ft noted. Several days of gage height record were not used when the float was beached. Record is complete and reliable except for the following: October 26-29, 2009 and November 1, 2009: ice affected days November 2, 2009: partial day record: station shut down for season. April 21, 2010: partial day record; station open for season. July 16-21 and 24-27, 2010: due to float beached in well
Datum Corrections.--	Levels were run to the outside staff gage on August 25, 2010 using RM3 as base. RP1 on the outside staff gage was found destroyed. However, a side shot on the 1.00 ft mark on the staff was found to be within 0.002 ft. A new staff section was installed exactly 1.00 ft lower than the existing staff gage. A new RP, RP2, elevation 2.64 ft, was established next to the new outside staff gage. All other reference marks were found to be within 0.02 ft of given elevations. No corrections were made. However, as the new staff section was set 1.00 ft lower than the existing staff, all RM elevations were adjusted by +1.00 ft. Adjusted elevations are: RM3—9.412 ft, RM2—9.912 ft, RM1—6.368 ft. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Beger fiberglass rod was used. It was checked on August 24, 2010.
Rating.--	The stilling well is located upstream of the bridge at the right abutment. The channel is straight for at least 100-feet upstream to 50-feet downstream of the bridge. A small tributary joins the Illinois just upstream of the gage station. The bridge, at times, may act as control. Otherwise, the natural channel acts as the control. Rating No. 6, dated June 3, 2008, was used for the period from October 1, 2009 through November 2, 2009. A new rating curve (rating 8) was developed (November 22, 2010). Rating No. 8 was applied to the period from April 21, 2010 to September 30, 2010. Six measurements (numbered 107 through 112), ranging in discharge from 6.31 cfs to 234 cfs, were taken this water year. These measurements covered the range in discharge except for lower daily flows from August 25 through September 30 and higher daily flows on May 23-25, May 28 – June 2, and June 5-14, 2010. The instantaneous peak flow of 393 cfs occurred at 1030 on May 29, 2010 at a gage height of 4.42 feet and a shift of 0.07 feet and exceeded Measurement No. 109, made on May 27, 2010 by 1.0 ft. in stage.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were applied by time from 00:00 October 1 to November 2, 2009 and from 13:00 July 27, 2010 to the end of the water year. Shifts were distributed by stage using two variable stage-shift relationships: ILLRANSHF10A, based on measurements 108 and 109, applied from April 21 to the peak discharge at 13:30 on May 29; and ILLRANSHF10B, based on measurements 109-111, applied from the peak discharge until 12:15 on July 27. Open-water measurements showed shifts ranging between -0.04 and +0.07 feet. Shifts were applied directly and given full weight with the exceptions of measurements 107 and 111 which were adjusted -9% and 3% respectively, to smooth shift distribution.
Special Computations.--	Discharge values were estimated for November 2, 2009 (shut-down) and April 21, 2010 (start-up) from the partial day record and consideration of previous and subsequent days of good record. Discharge was also estimated on the ice affected days of October 26-29 and November 1, 2009. Discharge on those days was estimated by averaging the hourly discharge values, excluding the rising and falling limb of the daily hydrograph. Discharge was estimated on July 16-21 using previous and following good record and temperature trends. Discharge was estimated on July 24-27 by applying the -0.12 ft gage height change found on July 27 as a flush correction back to 14:00 July 24.
Remarks.--	The record is good except for October 26-29, November 1- 2, 2009, April 21, and July 16-21, 2010 which was estimated and is considered poor, and July 24-27 which were also estimated but considered fair. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.
Recommendations.--	Evaluate Rating No. 8 during WY 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06617500 ILLINOIS RIVER NEAR RAND

RATING TABLE--

ILLRANCO06 USED FROM 01-Oct-2009 TO 02-Nov-2009
ILLRANCO07 USED FROM 20-Apr-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8	e11	--	--	--	--	--	52	276	50	15	5
2	7.8	e10	--	--	--	--	--	51	236	56	21	4.7
3	6.9	--	--	--	--	--	--	48	214	52	23	4.6
4	7.1	--	--	--	--	--	--	51	213	49	21	4.6
5	8.1	--	--	--	--	--	--	63	261	47	21	4.3
6	8.3	--	--	--	--	--	--	60	301	42	18	4.2
7	7.4	--	--	--	--	--	--	51	327	39	21	4.2
8	7.4	--	--	--	--	--	--	53	351	72	19	4.5
9	8.1	--	--	--	--	--	--	53	306	51	18	5.4
10	7.6	--	--	--	--	--	--	66	287	39	15	5.2
11	7.4	--	--	--	--	--	--	67	273	37	13	5
12	7.7	--	--	--	--	--	--	71	259	33	14	4.8
13	8	--	--	--	--	--	--	69	326	30	15	4.8
14	8.2	--	--	--	--	--	--	94	253	29	12	4.7
15	10	--	--	--	--	--	--	104	166	28	10	4.5
16	12	--	--	--	--	--	--	90	144	e26	9.1	4.4
17	9.8	--	--	--	--	--	--	92	130	e24	11	4.3
18	8.9	--	--	--	--	--	--	100	120	e23	9.7	4.2
19	8.8	--	--	--	--	--	--	131	115	e22	9.1	3.9
20	9	--	--	--	--	--	--	154	127	e22	12	3.9
21	9.4	--	--	--	--	--	e63	170	118	e25	10	4.1
22	8.5	--	--	--	--	--	78	229	109	38	8.3	4.2
23	7.7	--	--	--	--	--	64	278	99	37	7.2	5.2
24	8.1	--	--	--	--	--	51	309	89	e27	6.7	5.6
25	8.7	--	--	--	--	--	61	245	80	e23	6.3	5.4
26	e8.2	--	--	--	--	--	55	200	77	e20	5.8	5
27	e7.7	--	--	--	--	--	57	226	72	e18	5.6	4.8
28	e8.1	--	--	--	--	--	81	287	60	19	5.3	4.6
29	e9.1	--	--	--	--	--	73	361	53	17	5.9	4.6
30	8.5	--	--	--	--	--	57	347	49	21	5.3	4.5
31	8.4	--	--	--	--	--	--	308	---	17	5	---
TOTAL	258.9	21	--	--	--	--	640	4480	5491	1033	378.3	139.2
MEAN	8.35	10.5	--	--	--	--	64	145	183	33.3	12.2	4.64
AC-FT	514	42	--	--	--	--	1270	8890	10890	2050	750	276
MAX	12	11	--	--	--	--	81	361	351	72	23	5.6
MIN	6.9	10	--	--	--	--	51	48	49	17	5	3.9

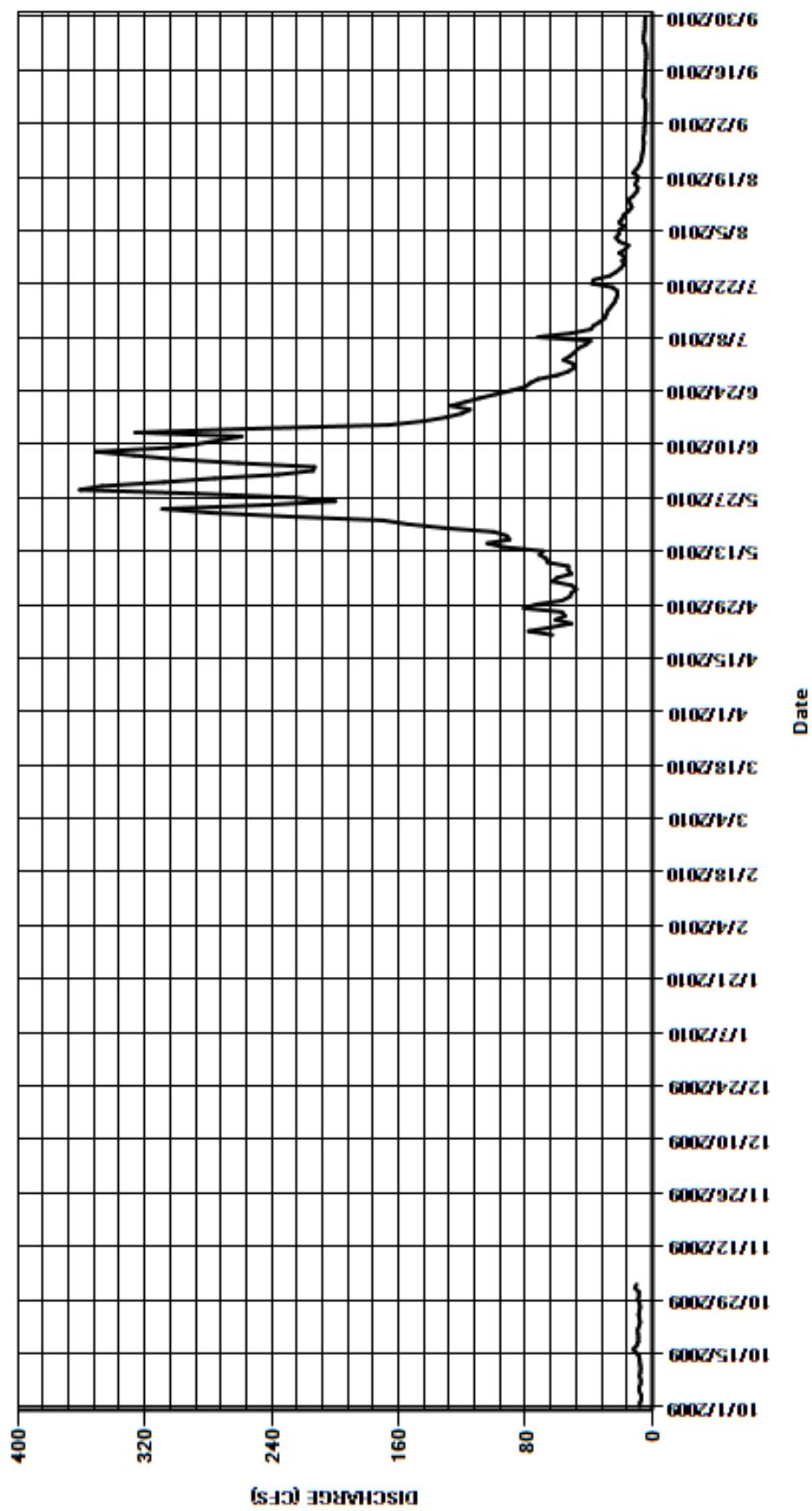
CAL YR	2009	TOTAL	12033.4	MEAN	57.3	MAX	252	MIN	4.7	AC-FT	23870	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	12441.4	MEAN	63.5	MAX	361	MIN	3.9	AC-FT	24680	(PARTIAL YEAR RECORD)

MAX DISCH: 393 CFS AT 13:30 ON May. 29,2010 GH 4.42 FT. SHIFT 0.07 FT.

MAX GH: 4.42 FT. AT 13:30 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617500 ILLINOIS RIVER NEAR RAND
WY2010 HYDROGRAPH



YAMPA RIVER BASIN
MORRISON CREEK BELOW SILVER CREEK
Water Year 2010

Location.--	Lat. 40° 14'44", Long. 106° 47'12", (Green Ridge Quadrangle), in Section 10, T3N, R84W in Routt County, Hydrologic Unit 14050001, on the left bank of Morrison Creek approximately 50 feet below the bridge located immediately downstream of the confluence of Silver Creek and Morrison Creek.
Drainage and Period of Record.--	71.86 square miles. Established by the State Engineer's Office in October 2008.
Equipment.--	Station established in October 2008. Sutron shaft encoder (SDI12) connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry housed in an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes with cleanouts. Primary reference is an electric drop tape inside the well. An old staff gage remains in the creek but should not be used as a reference since its datum does not match the primary reference. At low flows the control is a natural small cobble riffle downstream of the gage. At medium flows the small cobble riffle is drowned out as the channel controls and at higher flows the channel will overbank on the right and left side of the channel.
Hydrologic Conditions.--	71.9 square miles of drainage within the basin of moderate terrain near the gage station, originates in steep mountainous terrain of the Silver Creek and Morrison Creek drainages in the Routt National Forest south of the Service Creek Wilderness Area. The channel slope is moderate and consists of gravel and small to medium size cobbles ranging from 4 to 12 inches in diameter. Some large boulders are located along the banks and in the vicinity of the bridge. Gage location is immediately downstream of the Morrison Creek bridge crossing just downstream of the confluence of Morrison Creek and Silver Creek. The channel is straight for at least 100 feet downstream of the gage. The right and left banks are subject to overflow. Altitude of gage is approximately 7880 ft (from topographic map).
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with DCP data log as backup. Continuous record kept from October 1-27, 2009 and April 20 - September 30, 2010. Due to weather constraints, the gage station is closed in the winter months. The gage station was visited six times during WY 2010 to ensure the instruments remained calibrated. Several calibration corrections were made during WY 2010. On May 26, 2010 the shaft encoder was adjusted by +0.01 ft. to match the primary reference gage. On June 28, 2010 a -0.01 ft correction was made to the shaft encoder. A flush correction of +0.01 ft was made on July 28, 2010. Record is complete and reliable except for Oct. 27, 2009 (partial day record due to gage station closure for the winter); Apr. 20, 2010 (partial day record, due to gage station startup after the winter season); and, September 28-30, 2010 due to backwater effect from beaver dam.
Datum Corrections.--	Levels were last run on October 7, 2008, when the gage was constructed. Benchmarks were established on that date.
Rating.--	At low flows the control is a natural small cobble riffle downstream of the gage. At medium flows the small cobble riffle is drowned out as the channel controls. At higher flows the channel will overbank on the right and left side of the channel which consist of willows, small shrubs and grass.. The PZF in the channel is approximately 1.00 ft. Rating No. 2, dated October 8, 2008, was used for WY2010. Rating definition is fair to 500 cfs (150% of the highest discharge measurement made at the gage). Five measurements (Nos. 10- 14) were made this year, ranging in discharge from 5.94 cfs to 334 cfs. These measurements covered the range in discharge except for lower daily flows on August 27 – September 8, September 11-22, and September 25-27, 2010 and higher daily flows from May 21 – June 9, and June 13, 2010. The instantaneous peak flow of 582 cfs occurred at 2045 on May 29, 2010 at a gage height of 4.84 feet and a shift of 0.00 ft. It exceeded Measurement No. 11, made on May 26, 2010 by 0.92 feet in stage.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from October 1 - 27, 2009, April 20 – May 26 (09:50), 2010 and September 28 (10:00)-September 30, 2010. Shifts were distributed by stage using shift curve MORBSCCO2-SC1 from May 26 (10:00) – September 28 (09:00), 2010. Open-water measurements showed shifts varying between -0.08 and +0.05 feet. Shifts were applied directly and given full weight, except for Measurement No. 12, which was discounted 3% to smooth shift distribution.
Special Computations.--	Discharges were estimated on close down and start-up dates (October 27, 2009 and April 20, 2010) using the partial day record. Discharge was also estimated from September 28-30, 2010 due to backwater effects from a beaver dam.
Remarks.--	The record is considered fair throughout the record period. It is rated fair because it is a recently installed gage with natural channel control and the stage-discharge relationship is not yet well defined. Discharge was estimated on October 27, 2009 (shut-down) and April 20, 2010 (start-up), based on partial day record. Discharge was also estimated from September 28-30, 2010 using the preceding period of record. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.
Recommendations.--	Levels need to be run in WY2011 to establish additional reference marks, check the PZF and obtain channel cross section at the control. Revise the rating after WY 2011. Continue to evaluate factors (moss, irrigation pumping, upstream diversion structures, gravel operations, sand bar, beaver dams, etc.) that are potentially contributing to shift variations at gage heights between 1.7 and 2.0 feet.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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MORRISON CREEK BELOW SILVER CREEK

RATING TABLE--

MORBSCCO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

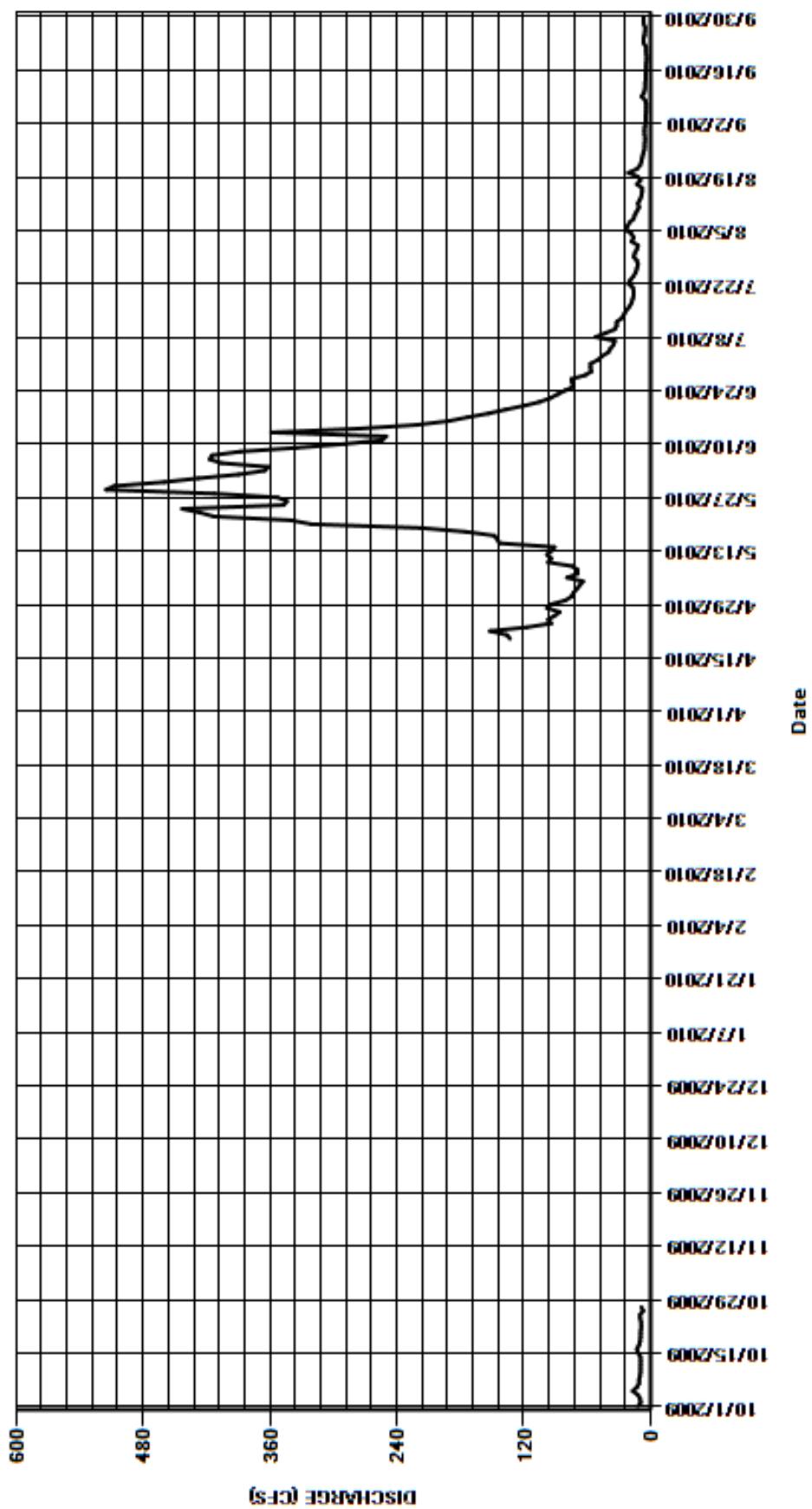
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	---	---	---	---	---	---	75	428	57	12	5.5
2	9.4	---	---	---	---	---	---	73	390	50	18	5
3	10	---	---	---	---	---	---	70	365	46	16	4.9
4	12	---	---	---	---	---	---	67	362	40	18	4.7
5	17	---	---	---	---	---	---	64	406	38	23	4.5
6	13	---	---	---	---	---	---	79	417	35	22	4.4
7	11	---	---	---	---	---	---	69	415	34	20	4.3
8	11	---	---	---	---	---	---	69	388	52	16	5.2
9	10	---	---	---	---	---	---	74	335	43	15	8.5
10	9.7	---	---	---	---	---	---	97	289	34	13	6.2
11	9.7	---	---	---	---	---	---	94	254	32	11	5.4
12	9.4	---	---	---	---	---	---	98	250	32	12	5.1
13	9.4	---	---	---	---	---	---	94	359	27	10	5
14	9.7	---	---	---	---	---	---	91	276	25	8.8	4.9
15	12	---	---	---	---	---	---	143	221	23	8.1	4.7
16	13	---	---	---	---	---	---	145	191	20	8	4.4
17	11	---	---	---	---	---	---	148	173	18	13	4.3
18	10	---	---	---	---	---	---	175	153	17	9.6	4.1
19	9.6	---	---	---	---	---	---	217	137	16	12	3.8
20	9.4	---	---	---	---	---	e133	321	120	16	21	4.1
21	9.3	---	---	---	---	---	136	340	105	17	13	4.3
22	8.8	---	---	---	---	---	152	413	95	21	9.8	4.4
23	9.1	---	---	---	---	---	117	426	88	19	8.8	6.8
24	9.8	---	---	---	---	---	94	443	81	16	8	7
25	10	---	---	---	---	---	97	347	73	14	7.1	5.8
26	7.1	---	---	---	---	---	91	344	74	13	6	5.4
27	e8.8	---	---	---	---	---	86	353	75	12	5.5	5.1
28	---	---	---	---	---	---	98	413	62	13	5.5	e6.5
29	---	---	---	---	---	---	94	515	56	16	5.3	e6.8
30	---	---	---	---	---	---	81	507	57	15	5.7	e6.8
31	---	---	---	---	---	---	---	460	---	13	5.9	---
TOTAL	281.2	---	---	---	---	---	1179	6824	6695	824	367.1	157.9
MEAN	10.4	---	---	---	---	---	107	220	223	26.6	11.8	5.26
AC-FT	558	---	---	---	---	---	2340	13540	13280	1630	728	313
MAX	17	---	---	---	---	---	152	515	428	57	23	8.5
MIN	7.1	---	---	---	---	---	81	64	56	12	5.3	3.8
CAL YR	2009	TOTAL	19243.8	MEAN	102	MAX	485	MIN	5.7	AC-FT	38170	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	16328.2	MEAN	85.5	MAX	515	MIN	3.8	AC-FT	32390	(PARTIAL YEAR RECORD)

MAX DISCH: 582 CFS AT 20:45 ON May. 29,2010 GH 4.84 FT. SHIFT 0 FT.

MAX GH: 4.84 FT. AT 20:45 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MORRISON CREEK BELOW SILVER CREEK
WY2010 HYDROGRAPH



YAMPA RIVER BASIN
YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
Water Year 2010

Location.--	Lat. 40°20'27", Long. 106°48'29", (Blacktail Mountain, Colorado Quadrangle), SE1/4 of the SE1/4 in Section 33, T5N, R84W of the Sixth Principal Meridian in Routt County, at County Road 18C bridge.
Drainage and Period of Record.--	361 sq mi (from topographic maps). State Engineer maintained station. Staff gage installed at current site and datum. Spot records from staff gage kept from April 1989 to October 2003 with some years with record dating back to 1978. Continuous hydrographic records kept from October 2003 to present.
Equipment.--	Sutron shaft encoder Model 5600-0531 housed in a 42-inch diameter corrugated metal pipe shelter and well. The shaft encoder is connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Stilling well equipped with two 1.5-inch intakes connected to risers. The inside staff, with a range of approximately 0.00 to 6.66 feet, is the primary reference gage and is located on the inside wall of the pipe.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up in the Flattops Wilderness Area. Discharge affected by storage and subsequent releases of Yampa River flows from Stagecoach Reservoir approximately 5 miles upstream. The channel slope is moderate and consists of small gravel and rock. Channel is straight for approximately 100 feet upstream and 500 feet downstream with a slight bend as the river passes under the bridge. Altitude of gage is approximately 6880 ft (from topographic map).
Gage-Height Record.--	Primary record is hourly averages of 15-minute satellite data with the DCP data log as backup. Continuous record kept from October 1, 2009 to September 30, 2010. The record is complete and reliable, except for the following ice-affected days: November 16-17, 20-21, 24-28, and 30, 2009; December 1, 3-6, 19-22, and 25-29, 2009; January 1, 4-5, 7, 21-22, 25-27, and 30-31, 2010; February 1-5, 8-11, 15-17, 19, 21-25, and 27, 2010; March 2-4, 7, 12-13, 16-17, 20-22, 25, and 28, 2010; and the following inaccurate gage height days (due to frozen intake pipes to stilling well): December 7-17, 2009 and January 8-20, 2010. Shaft encoder/flush and datum corrections were made either at the time of site visit or upon development of the record and ranged in value from 0.03 ft to -0.06 ft. Gage heights are recorded throughout the winter months; however, the river can be partially frozen, which in turn may result in the record being affected by ice conditions. The stilling well is generally kept ice free through use of a stock tank heater.
Datum Corrections.--	Levels were not run in WY2010. Levels were last run on August 27, 2008 using the staff gage as the reference. Three other benchmarks were established at the time (RM1, RM2, and RM3).
Rating.--	Channel itself acts as the control. The right and left banks are steep and are about 6 to 8 feet high, above which flow would become sheet flow throughout a wide floodplain. Rating No. 12, in use since May 16, 2008, was used the entire water year. It is well defined to flows of 2,500 cfs, 150% of the historical highest discharge measurement made in WY2008. Ten measurements (numbers 162 through 171), ranging in discharge from 52.1 to 906 cfs, were taken in WY 2010. These measurements covered the range in discharge except for higher daily flow on May 22 – June 9 and June 13, 2010 and lower daily flow on October 23 and December 2, 2009; February 14-15, and March 11-16 and 27-28, 2010. The peak instantaneous flow of 1430 cfs occurred at 0000 on May 30, 2010 at a gage height of 4.99 ft, with a shift of -0.07 ft. This peak exceeded the stage of measurement 168 made on May 26, 2010 by 0.82 ft. Minimum daily flow of 50 cfs occurred on March 15, 2010.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and distributed by time. Shifts were time distributed from October 1 2009 – September 30, 2010. Open-water measurements showed shifts varying between -0.12 ft and +0.01 ft. Shifts were applied directly and given full weight, except for Measurements No. 162, and 169 which were discounted from +3% and -6%, respectively, to smooth shift distribution.
Special Computations.--	Discharge values were estimated for those days affected by ice and inaccurate gage height. Estimated discharge values were computed by interpolation between adjacent good record, consideration of temperature and precipitation data from the Colorado Climate Center (Steamboat Springs, CO weather station), and by comparison to discharge record from the USGS operated and maintained gage station located upstream approximately 5 miles on the Yampa River below Stagecoach Reservoir.
Remarks.--	The record is good except for periods affected by ice (November 16-17, 20-21, 24-28, and 30, 2009; December 1, 3-6, 19-22, and 25-29, 2009; January 1, 4-5, 7, 21-22, 25-27, and 30-31, 2010; February 1-5, 8-11, 15-17, 19, 21-25, and 27, 2010; March 2-4, 7, 12-13, 16-17, 20-22, 25, and 28, 2010), and inaccurate gage height (December 7-17, 2009 and January 8-20, 2010). Flow data for those days was estimated. These data points are considered fair to poor. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.
Recommendations.--	Rating No. 12 was developed after the extreme spring 2008 runoff conditions resulted in channel scouring. This rating should continue to be revisited as additional measurements are made and data points become available. A gravel bar has formed in the channel adjacent to the gaging station. If possible this should be removed during WY 2011 and effects of removal on the rating should be evaluated. Levels should be run in WY2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS

RATING TABLE--

YAMABVCO12 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

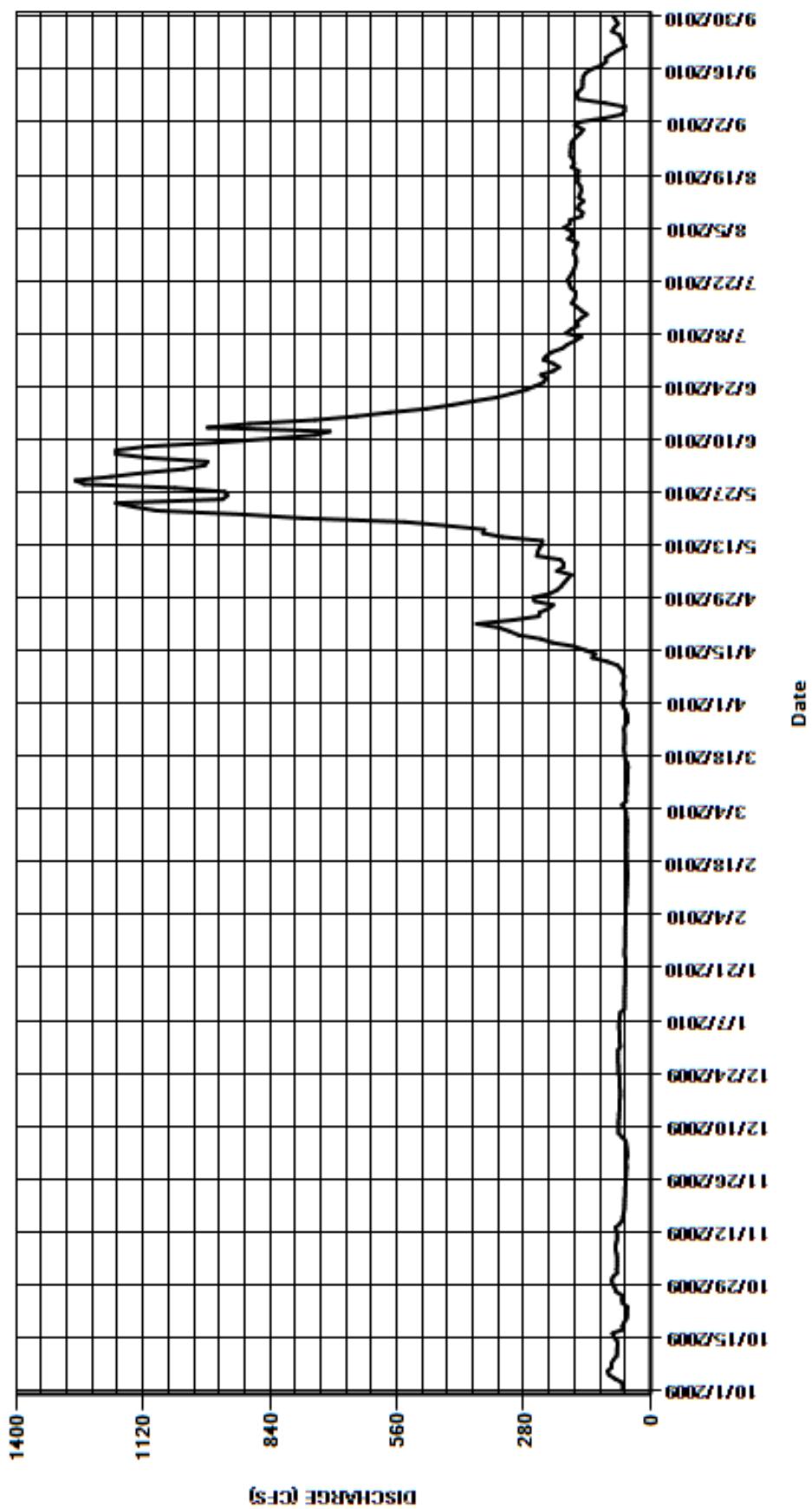
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	74	e54	e68	e56	52	63	206	1120	237	162	167
2	61	75	51	69	e55	e54	59	197	1030	230	182	155
3	64	74	e52	69	e55	e54	58	190	984	218	173	102
4	79	74	e53	e69	e55	e57	57	183	978	195	175	63
5	92	74	e54	e70	e55	63	60	175	1110	184	191	57
6	95	75	e55	70	55	54	62	207	1180	167	178	57
7	86	77	e63	e69	54	e55	60	193	1180	153	178	101
8	87	78	e71	e68	e54	53	58	192	1110	187	152	159
9	82	76	e71	e67	e53	54	61	199	960	176	150	163
10	75	74	e71	e58	e53	53	66	251	843	160	161	160
11	74	74	e71	e58	e53	51	73	249	741	163	158	151
12	74	75	e70	e58	52	e51	96	246	708	153	148	150
13	73	78	e70	e57	52	e51	129	240	978	141	159	150
14	74	68	e69	e57	51	51	122	239	886	153	155	149
15	81	62	e69	e57	e51	50	144	327	741	163	153	143
16	84	e61	e68	e57	e52	e51	168	370	649	174	155	130
17	61	e59	e68	e56	e52	e56	217	367	576	168	161	108
18	62	58	67	e56	53	56	242	450	494	166	160	98
19	58	58	e67	e56	e53	58	291	542	438	166	161	99
20	53	e57	e68	e56	53	e59	311	768	391	176	159	86
21	52	e57	e68	e56	e54	e58	335	900	339	179	174	72
22	52	56	e69	e55	e53	e58	384	1090	307	184	169	56
23	51	56	69	55	e53	58	304	1140	275	178	171	61
24	62	e56	71	57	e53	58	247	1180	255	173	177	65
25	63	e55	e71	e57	e53	e59	245	945	236	169	177	68
26	62	e55	e71	e57	52	57	226	934	231	166	176	85
27	76	e54	e72	e56	e53	51	215	940	242	164	176	80
28	79	e54	e72	56	52	e51	256	1050	215	165	172	72
29	84	53	e72	56	---	52	259	1250	202	169	164	77
30	86	e54	72	e56	---	55	223	1270	215	169	155	83
31	83	---	67	e56	---	60	---	1190	---	164	149	---
TOTAL	2228	1951	2056	1862	1490	1700	5091	17680	19614	5410	5131	3167
MEAN	71.9	65	66.3	60.1	53.2	54.8	170	570	654	175	166	106
AC-FT	4420	3870	4080	3690	2960	3370	10100	35070	38900	10730	10180	6280
MAX	95	78	72	70	56	63	384	1270	1180	237	191	167
MIN	51	53	51	55	51	50	57	175	202	141	148	56
CAL YR	2009	TOTAL	76890	MEAN	211	MAX	1290	MIN	51	AC-FT	152500	
WTR YR	2010	TOTAL	67380	MEAN	185	MAX	1270	MIN	50	AC-FT	133600	

MAX DISCH: 1430 CFS AT 00:00 ON May. 30,2010 GH 4.99 FT. SHIFT -0.07 FT.

MAX GH: 4.99 FT. AT 00:00 ON May. 30,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

YAMPARABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
WY2010 HYDROGRAPH



YAMPA RIVER BASIN
09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
Water Year 2010

Location.-- Lat. 40 24'29", long. 106 47'11", , (Steamboat Springs, Colorado, Quad., scale, 1:24,000), in SW1/4 of the NW1/4, in Section 11, T5N, R84W, (projected), Routt County, on left bank 0.4 miles downstream from Beaver Creek, 0.6 miles downstream from Storm King Creek, 4.5 miles upstream from its confluence with the Yampa River, and 6.0 miles southeast of Steamboat Springs.

Drainage and Period of Record.-- 42.4 sq mi (from topographic maps)

Equipment.-- Sutron shaft encoder (SDI12) connected to a Sutron HDR data collection platform (DCP) with satellite telemetry. The encoder and DCP are housed in a 42-inch diameter corrugated metal shelter and well. The station is equipped with two 2-inch intakes connected to risers. Primary reference gage is an inside staff (range of 0.00 to 6.6 ft.) located on inner wall of 42-inch diameter corrugated metal well. An adjustable brass screw/nut on the edge of the equipment shelf is the secondary reference gage but was not used this water year. The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side.

Hydrologic Conditions.-- The basin above the gage is 42.4 square miles consisting of steep mountainous terrain originating at the top of Mount Werner and Walton Peak. Channel slope is steep at gage location and consists of large boulders (up to approximately 3-4 feet in diameter) typical of mountainous streams. The channel is straight for 200-feet upstream to 200-feet downstream of the gage, which is located immediately upstream of the weir. The right bank is high and less subject to overflow than the left bank. Some development has occurred in the vicinity of the gage, and a large home is located above the gage location.

Gage-Height Record.-- Primary record is hourly averages of 15-minute satellite data with the DCP log as backup. Continuous gage height records were kept from October 1 to November 1, 2009 and April 16 to September 30, 2010. Records were not kept during the winter period (November 2, 2009 to April 15, 2010), due to site accessibility and frozen channel issues. The record is complete and reliable except for the following dates: November 1, 2009 and April 16, 2010, which were partial records due to the shut-down and start-up of the station in the Fall and Spring respectively. A shaft encoder correction (+0.14 ft) was made on May 26 at the time of a site visit. A shaft encoder correction of +0.04 ft and offsetting flush correction of -0.04 ft were made on the July 27 visit.

Datum Corrections.-- Levels were not run in WY2010. Levels were last run on August 27, 2008 to establish an adjustable brass screw/nut on the edge of the equipment shelf in the shelter using RM-1 as the base. Three additional reference markers were established at the same time RM 5, 6 and 7. No corrections were made.

Rating.-- The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side. This section is 9-feet wide at the downstream edge and 19-feet wide at the upstream edge. Rating No. 8, developed in November 2003, and extended in June 2007, was used in WY2010. Four measurements (numbers 65 through 68) were made during the current water year, ranging in discharge from 9.29 to 35.3 cfs. They cover the range in stage experienced except for higher daily flows April 16 to July 16, 2010, July 21-23, and August 4-5; and lower daily flows August 26-29 and September 1-22 and 25-30, 2010. The instantaneous peak flow of 1980 cfs occurred at 1900 on June 7, 2010 at a gage height of 3.05 feet, with a shift of 0.01 feet. It exceeded measurement No. 66, made on April 16, 2010 by 2.23 ft. in stage. Minimum daily flows of 6.1 cfs occurred on September 18-21, 2009. There are no high flow measurement facilities at the gage site. Maximum stage for a safe wading measurement is about 1.20 ft (100 cfs).

Discharge.-- Shifting section control method was used throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. This years' measurements had unadjusted shifts ranging between -0.01 to 0.02 feet. Shifts were given full weight and applied directly.

Special Computations.-- The station is closed during the winter months and no discharges are estimated during this period. Discharge data for November 1, 2009 (shut-down) and April 16, 2010 (start-up) were estimated using flow measurement data, partial day DCP data, and consideration of adjacent good data.

Remarks.-- The record is good except as follows: November 1, 2009 and April 16, 2010, which were estimated and should be considered fair to poor and April 20-24, May 15, and May 17 – July 9, 2010, which should also be considered fair to poor because the flow exceeded twice the highest WY2010 measurement. The peak flow for the year is considered poor. Because this gage station is used for water administration purposes only, the rating is considered more critical during low flow periods. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.

Recommendations.-- Due to high stream velocities/depth of flow, it is highly recommended that no stream flow measurements be waded above a gage height of 1.20 feet, that chest waders be worn above a gage height of 1.00 feet, and that a second person must be on site for safety reasons. Measurements on the weir should take into account angular flow. The broad-crested weir is wide enough to take reliable measurements at its upstream edge, though safety must be considered when on the weir. The drop tape needs to be constructed and installed water year 2011. The adjustable brass nut and drop tape will become the primary reference. Gage intakes should be flushed at all visits, except during peak runoff. Flush valves in well are difficult to turn without a pipe wrench, and require entry into the stilling well. Stilling well air quality should be checked when opening gage in Spring and in early Fall. An outside staff gage should be installed on left weir wing wall near terminus of stilling well intakes.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.

RATING TABLE--

WLTNCKCO08 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

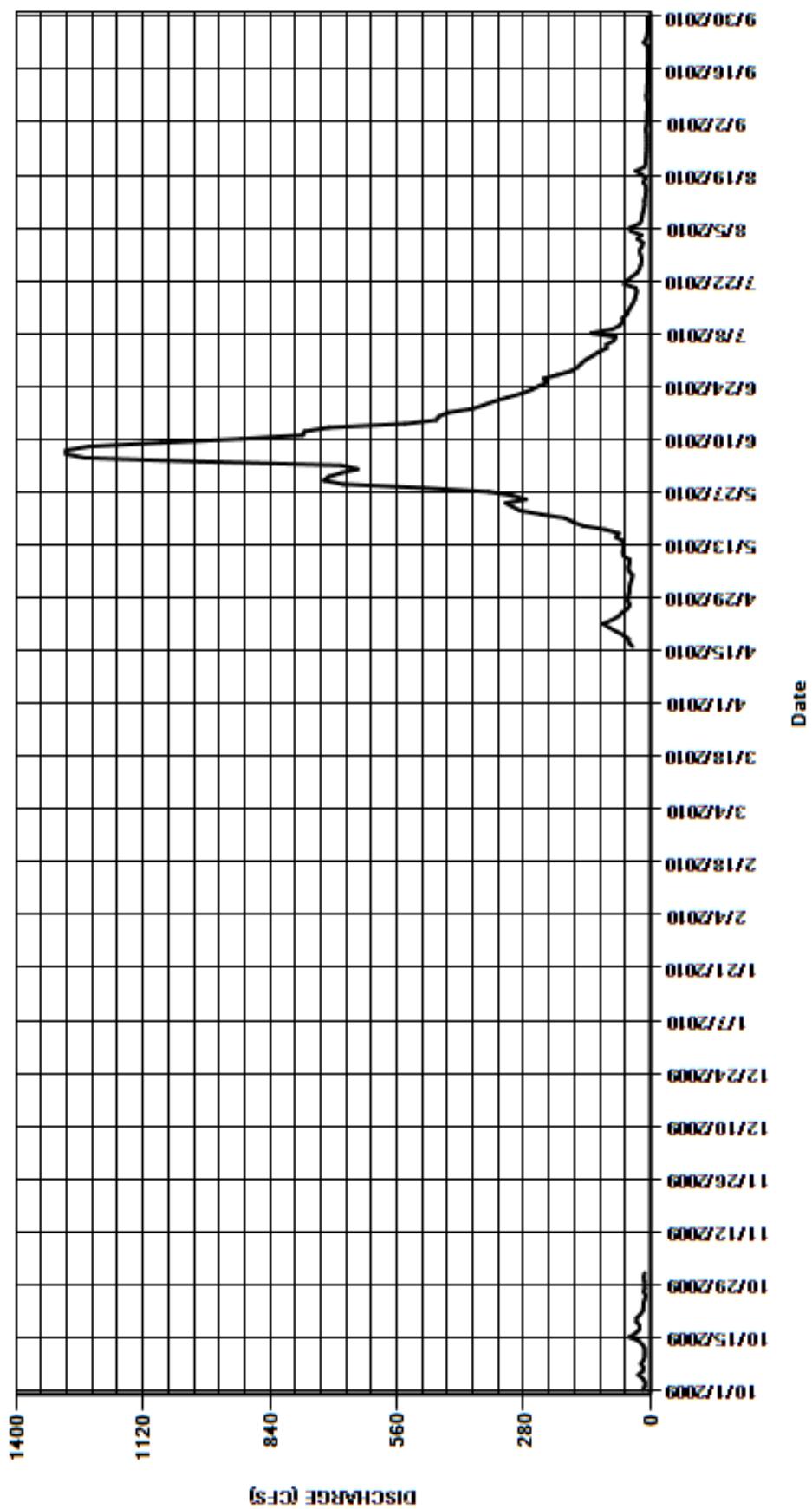
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	e13	---	---	---	---	---	46	683	143	17	8.9
2	13	---	---	---	---	---	---	46	647	128	29	8.3
3	12	---	---	---	---	---	---	44	683	115	20	7.9
4	17	---	---	---	---	---	---	41	993	97	44	7.7
5	27	---	---	---	---	---	---	40	1250	98	45	7.5
6	17	---	---	---	---	---	---	48	1290	81	24	7.2
7	16	---	---	---	---	---	---	49	1290	77	20	7.1
8	22	---	---	---	---	---	---	47	1240	131	19	8.4
9	15	---	---	---	---	---	---	46	1080	86	17	9.2
10	13	---	---	---	---	---	---	60	904	68	15	7.7
11	13	---	---	---	---	---	---	61	768	62	13	7.5
12	13	---	---	---	---	---	---	60	764	62	14	7.3
13	18	---	---	---	---	---	---	60	710	52	12	7.2
14	26	---	---	---	---	---	---	62	542	49	11	7.2
15	47	---	---	---	---	---	---	77	473	44	10	6.9
16	33	---	---	---	---	---	e40	70	467	39	11	6.8
17	25	---	---	---	---	---	48	100	447	35	16	6.8
18	24	---	---	---	---	---	49	150	393	33	11	6.1
19	31	---	---	---	---	---	60	172	368	31	19	6.1
20	31	---	---	---	---	---	76	188	345	33	33	6.1
21	23	---	---	---	---	---	91	241	316	58	14	6.1
22	17	---	---	---	---	---	105	288	286	51	11	6.3
23	16	---	---	---	---	---	85	304	263	41	11	15
24	16	---	---	---	---	---	71	320	247	30	10	9.8
25	13	---	---	---	---	---	63	275	227	25	9.6	7.6
26	11	---	---	---	---	---	51	304	236	22	9.1	7.2
27	e15	---	---	---	---	---	46	358	205	20	8.6	6.8
28	e13	---	---	---	---	---	50	502	175	20	8.8	6.5
29	e13	---	---	---	---	---	50	678	161	23	8.9	6.5
30	e14	---	---	---	---	---	48	721	153	25	9.7	6.5
31	e15	---	---	---	---	---	---	711	---	19	11	---
TOTAL	596	13	---	---	---	---	933	6169	17606	1798	511.7	226.2
MEAN	19.2	13	---	---	---	---	62.2	199	587	58	16.5	7.54
AC-FT	1180	26	---	---	---	---	1850	12240	34920	3570	1010	449
MAX	47	13	---	---	---	---	105	721	1290	143	45	15
MIN	11	13	---	---	---	---	40	40	153	19	8.6	6.1
CAL YR	2009	TOTAL	31181.6	MEAN	159	MAX	807	MIN	6.8	AC-FT	61850	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	27852.9	MEAN	139	MAX	1290	MIN	6.1	AC-FT	55250	(PARTIAL YEAR RECORD)

MAX DISCH: 1980 CFS AT 19:00 ON Jun. 07,2010 GH 3.05 FT. SHIFT 0.01 FT.

MAX GH: 3.05 FT. AT 19:00 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
WY2010 HYDROGRAPH



YAMPA RIVER BASIN
WILLOW CREEK BELOW STEAMBOAT LAKE
Water Year 2010

Location.--	Lat. 40 47'28", Long. 106 56'40", (Hahns Peak Quadrangle), in Section 29, T10N, R85W in Routt County, on left bank 50-feet below the Steamboat Lake outlet.
Drainage and Period of Record.--	Gage location is immediately downstream of reservoir outlet, thus flow is dictated by outlet opening position rather than drainage area runoff. The drainage area of Steamboat Lake is 35.5 square miles. 1979 to present
Equipment.--	Sutron shaft encoder (SDI12) housed in a steel box shelter on an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a separate NEMA housing box several feet from the stilling well. There is no outside staff. Primary reference is a steel drop tape referenced to a non-adjustable screw set into the edge of wooden instrument shelf.
Hydrologic Conditions.--	The basin consists of steep mountainous terrain originating at the top of Sand Mountain, Diamond Peak, and other portions of the mountain range dividing the Elk River drainage and Little Snake River drainage. The channel slope is moderate at the gage and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Releases from Steamboat Lake control the flow in Willow Creek.
Gage-Height Record.--	Primary record is hourly averages of transmitted 15-minute gage height data with the DCP log as backup. Record was kept from October 1 to October 26, 2009 (DCP shut-down for winter) and April 27 (DCP start-up in spring) to September 30, 2010. The reservoir outlet gate valve was closed on November 1, 2009 and flow values were estimated between October 26 and November 1, 2009. Releases from the reservoir were kept constant during this period. No water was released from the reservoir during the winter months (November 1, 2009 through April 25, 2010). The reservoir outlet gate valve was opened on April 26, 2010 at approximately 11:00 and the DCP was started for the season the next day. The outlet gage height record is complete and reliable except for the following days: October 26 to November 1, 2009 and April 26 -27, 2010, which were estimated. Several datum corrections were necessary this water year. The shaft encoder was set at an estimated gage height when the station was opened on April 27, 2010. That estimate was incorrect and a correction of +0.20 was applied from April 26 - June 9, 2010. A shaft encoder calibration of -0.02 ft was applied on June 26, 2010 and prorated to June 9, 2010. A shaft encoder calibration of +0.02 ft was applied on July 28, 2010 and prorated to June 26, 2010. A shaft encoder calibration of -0.04 ft was applied from 8/15/2010 through 8/24/2010 because the outlet gate exercise on August 15, 2010 caused the float tape to become removed from the instrument shelf opening.
Datum Corrections.--	Levels were run to the drop tape RP on the instrument shelf on August 24, 2010 using RM2 as base. The RP elevation was found to be within 0.02 ft of given elevations and no corrections were necessary. Only a single shot was made on the RP. Future levels at this gage should be sure to obtain a minimum of two shots on all points of interest. Tape length was measured as 6.323 ft equal to the given RP elevation. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 24, 2010.
Rating.--	Control is a cobble/small boulder riffle located just downstream of the gage. Gage location is immediately downstream of the Steamboat Lake reservoir outlet and flow is dictated by the outlet gate valve position. The channel slope is moderate and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Channel is straight for at least 100-ft downstream of the gage. The right and left banks are subject to overflow. Rating No. 12 was used the entire period of record. It is well defined to flows of 240 cfs, 150% of the historical highest discharge measurement made in WY2005. Four measurements (numbers 96 to 99) were taken ranging in discharge from 5.73 to 9.27 cfs. These measurements cover the range in discharge except for lower daily flows on November 1, 2009 and July 15-16, 2010; and higher daily flows on April 26 to June 22, 2010. The instantaneous peak discharge of 454 cfs occurred at 1115 on August 15, 2010 at a gage height of 3.84 ft (-0.04 ft gh corr. applied) with a shift of -0.01 ft. The peak occurred during a reservoir gate valve exercise. The peak discharge exceeded the stage of Measurement no. 98, made on July 28, 2010, by 2.71 ft.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied directly and were distributed by time from October 1 through November 1, 2009 and April 26 through September 30, 2010. Open-water measurements showed raw shifts ranging between -0.03 and 0.0 ft. Measurements were given full weight, except for Measurements 97 which was discounted 5% to smooth shift distribution.
Special Computations.--	No water is released from the reservoir during the winter months and no outlet record is kept. Estimated values for the period in which the outlet valve was open, but the DCP shut-down, were based upon previous good data (and the knowledge that the outlet gate valve remained unadjusted during this period).
Remarks.--	Record is considered good from October 1 to October 25, 2009 and June 21 - September 30, 2010. The record is considered fair from April 26 to June 20, 2010 because the flow exceeded twice the highest WY2010 measurement. The record is also considered fair on days in which the flow was estimated (October 26 – November 1, 2009 and April 26-27, 2010). The peak flow for the year, is also rated fair. Station maintained and record developed by Jean Ray, Tom Ley,a nd Dan Meyer.
Recommendations.--	Reassess Rating No. 12 and update if necessary.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK BELOW STEAMBOAT LAKE

RATING TABLE--

WILBSLC012 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7	e4.3	---	---	---	---	---	183	241	6	9.2	8.4
2	7	---	---	---	---	---	---	179	241	6	9.2	8.4
3	7	---	---	---	---	---	---	169	241	6	9.2	8.4
4	7	---	---	---	---	---	---	169	230	6	9.2	8.4
5	7	---	---	---	---	---	---	169	206	6	9.2	8.4
6	7	---	---	---	---	---	---	169	209	6	9	8.4
7	7	---	---	---	---	---	---	169	210	6.3	8.8	8.4
8	7	---	---	---	---	---	---	169	246	6.3	8.8	8.4
9	7	---	---	---	---	---	---	169	274	6.3	8.8	8.4
10	7	---	---	---	---	---	---	169	272	6.3	8.8	8.4
11	7	---	---	---	---	---	---	169	272	6.3	8.8	8.4
12	7	---	---	---	---	---	---	169	272	6.1	8.8	8.4
13	7	---	---	---	---	---	---	169	272	6	8.8	8.4
14	7	---	---	---	---	---	---	169	272	6	8.8	8.4
15	7	---	---	---	---	---	---	169	270	5.4	18	8.4
16	7	---	---	---	---	---	---	169	257	5.1	8.4	8.4
17	7	---	---	---	---	---	---	167	189	6.9	8.4	8.4
18	7	---	---	---	---	---	---	167	158	8.8	8.4	8.4
19	7	---	---	---	---	---	---	167	158	8.8	8.4	8.4
20	7	---	---	---	---	---	---	167	86	8.8	8.4	8.4
21	7	---	---	---	---	---	---	177	18	8.8	8.4	8.4
22	7	---	---	---	---	---	---	344	12	8.8	8.4	8.4
23	7	---	---	---	---	---	---	395	8.7	8.8	8.4	8.4
24	7	---	---	---	---	---	---	394	6	8.8	8.4	8.4
25	7	---	---	---	---	---	---	393	6	8.8	8.4	8.4
26	e7	---	---	---	---	---	e102	357	6	9	8.4	8.4
27	e7	---	---	---	---	---	e189	330	6	9.2	8.4	8.4
28	e7	---	---	---	---	---	186	330	6	9.2	8.4	8.4
29	e7	---	---	---	---	---	184	282	6	9.2	8.4	8.4
30	e7	---	---	---	---	---	184	241	6	9.2	8.4	8.4
31	e7	---	---	---	---	---	---	241	---	9.2	8.4	---
TOTAL	217.0	4.3	---	---	---	---	845	6880	4656.7	228.4	277.8	252.0
MEAN	7	4.3	---	---	---	---	169	222	155	7.37	8.96	8.4
AC-FT	430	8.5	---	---	---	---	1680	13650	9240	453	551	500
MAX	7	4.3	---	---	---	---	189	395	274	9.2	18	8.4
MIN	7	4.3	---	---	---	---	102	167	6	5.1	8.4	8.4

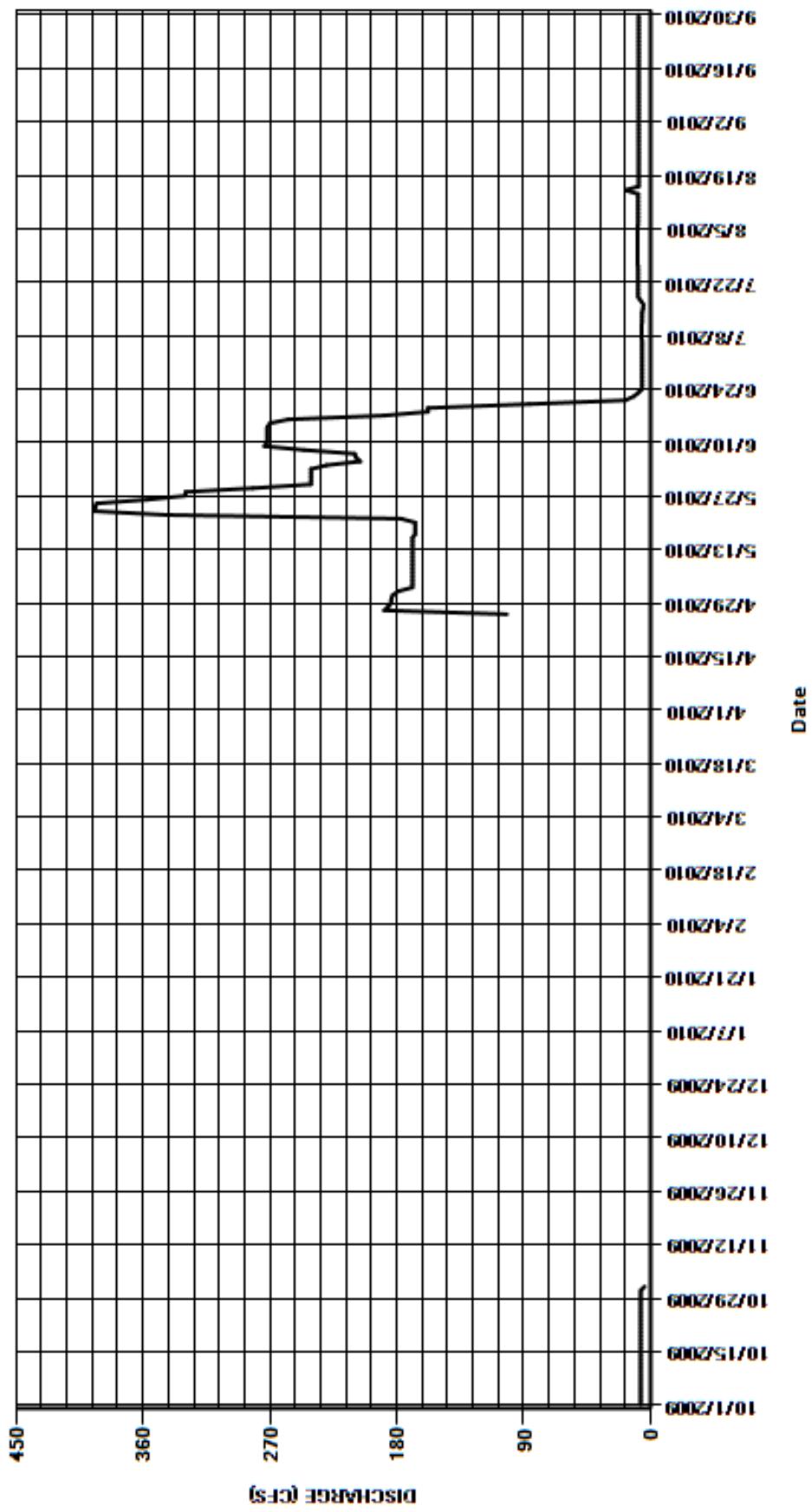
CAL YR	2009	TOTAL	13768.6	MEAN	71.7	MAX	333	MIN	4.3	AC-FT	27310	(PARTIAL YEAR RECORD)
WTR YR	2010	TOTAL	13361.2	MEAN	70.3	MAX	395	MIN	4.3	AC-FT	26500	(PARTIAL YEAR RECORD)

MAX DISCH: 454 CFS AT 11:15 ON Aug. 15,2010 GH 3.84 FT. SHIFT -0.01 FT. (GH CORR.-0.04 FT. APPLIED)

MAX GH: 3.84 FT. AT 11:15 ON Aug. 15,2010 (GH CORR.-0.04 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK BELOW STEAMBOAT LAKE
WY2010 HYDROGRAPH



YAMPA RIVER BASIN
WILLIAMS FORK AT MOUTH NEAR HAMILTON
Water Year 2010

Location.-- Lat. $40^{\circ}26'14''$, Long. $107^{\circ}38'50''$, in SE1/4 of the NW1/4 of Section 31, T6N, R91W, Moffat County, Hydrologic Unit 14050001, on left bank at coal mine service road crossing, 2,300 ft upstream from confluence with Yampa River, 6.1 mi north-northeast of Hamilton, and 8 mi south-southwest of Craig, CO.

Drainage and Period of Record.-- 419 sq mi. Gage established and operated by USGS February 1, 1984 to September 30, 2001. Gage re-established by State Engineer's Office April 26, 2005.

Equipment.-- Sutron high data rate (HDR) data collection platform (DCP) driven by a Sutron constant flow bubbler (CFB) and powered by a solar recharged 12-volt battery housed in a 6-foot square shelter over a 4-foot culvert well (no longer in use). Outside gage (the primary reference gage) is a wire weight gage (WWG) mounted on the upstream side of the bridge almost directly above the orifice. To address sediment issues and continued orifice clogging, the muffler, which was originally installed in July 2007, was removed in July 2009.

Hydrologic Conditions.-- The basin consists of moderate terrain near the gage station but originates in steep mountainous terrain in the Flattops. In the vicinity of the gage station, the channel slope is moderate. The bed material is composed of small rock, cobbles, and occasional large boulders. The primary use of water upstream of the gage is irrigation.

Gage-Height Record.-- Primary record is the hourly averages of the transmitted 15-minute satellite data with data from the DCP and CFB logs used as backup. Continuous records were kept from October 1, 2009 through September 30, 2010. The record is complete and reliable except for the following days: January 11 and March 1 – 4, 2010 due to ice conditions; April 13-25 and 28-29, 2010; May 1-5, 7-8, 13-14, and 16-19, 2010; June 1-3, 5-9, 11-15, 17-19, 24-27 and 29-30, 2010; July 1-3, 5-6, and 8-29, 2010 due to unstable gage height readings (extreme noise/chatter), likely due to high flow and sediment load. Gage height calibration corrections for WY2010 were made at the time of site visits and ranged from +0.01 to -0.20 ft. Correction associated with measurement 68 was not made in the field.

Datum Corrections.-- Levels were run to the wire weight gage check bar and to the bottom of the wire weight on August 24, 2010 using RM6 as base. Both reference points were found to be within 0.02 ft of given elevations and no corrections were necessary. Two shots on RM4 failed the side shot tolerance test. Future levels at this gage should carefully evaluate RM4. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 24, 2010.

Rating.-- The shelter is located upstream of the bridge on the left abutment. The orifice is located slightly underneath the bridge at the left abutment. The stream approaches the gage from a moderate left bend 300 ft upstream; the reach is then fairly straight all the way downstream to a cobble riffle, low water control 300 to 400 ft downstream of the gage. The high water control is the bridge opening. Rating No. 7, created on February 9, 2006 (and extended on May 20, 2008 to include the high gage heights recorded in WY2008), was used throughout the entire water year. Nine measurements, numbered 59 through 67, were taken during WY2010. Measurements ranged in discharge from 41.7 to 920 cfs and covered the range in discharge, except for lower daily flows on November 15-17, 24-25, and 30, December 3-9, 2009, January 31, February 3-4, 10-11, 16, 24-25, March 1-4, July 24, 26, August 14-17, 19, 24 – September 30, 2010; and higher daily flows on May 19 – June 10, 2010. The peak instantaneous flow of 2040 cfs occurred at 0500 on May 29, 2010 at the peak gage height of 7.04 ft (gage height correction of -0.01 ft applied) with a shift of 0.01 ft. The peak gage height exceeded the stage of Measurement 64 made May 25, 2010 by 1.69 ft.

Discharge.-- Shifting control method was applied throughout WY2010. Shifts were applied as defined by measurements and were distributed by time throughout the water year. Open-water measurements showed shifts varying between +0.01 and +0.05 ft. Shifts were applied directly and given full weight, except for measurements Nos. 60 and 62, which were discounted +2% and +3% respectively to smooth shift distribution. Shifts after adjustment ranged between +0.01 and +0.05 ft.

Special Computations.-- Discharge values were estimated for days of uncertain/unreliable gage height record (April 19 - July 29, 2010) by evaluation of the transmitted unstable gage height data. Discharge values were also estimated for "b" (ice-affected) days (January 11 and March 1-4, 2010) by consideration of weather data and previous and subsequent periods of good record.

Remarks.-- The record is good except for January 11 and March 1-4, 2010 due to ice conditions and periods of time during April 19 - July 29, 2010 due to unstable gage height readings (extreme noise/chatter). Discharge values were estimated during these periods and the record is considered poor for these dates. Station maintained and record developed by Jean Ray, Tom Ley, and Dan Meyer.

Recommendations.-- Levels should be re-run and the PZF reassessed in WY2011. In addition, Rating No. 7 should be evaluated based upon the results of a third consecutive year of levels data and consideration of lower flows. Install radar sensor on bridge and run simultaneously with CFB to compare recorded data.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLIAMS FORK AT MOUTH NEAR HAMILTON

RATING TABLE--

WMFKMHCO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

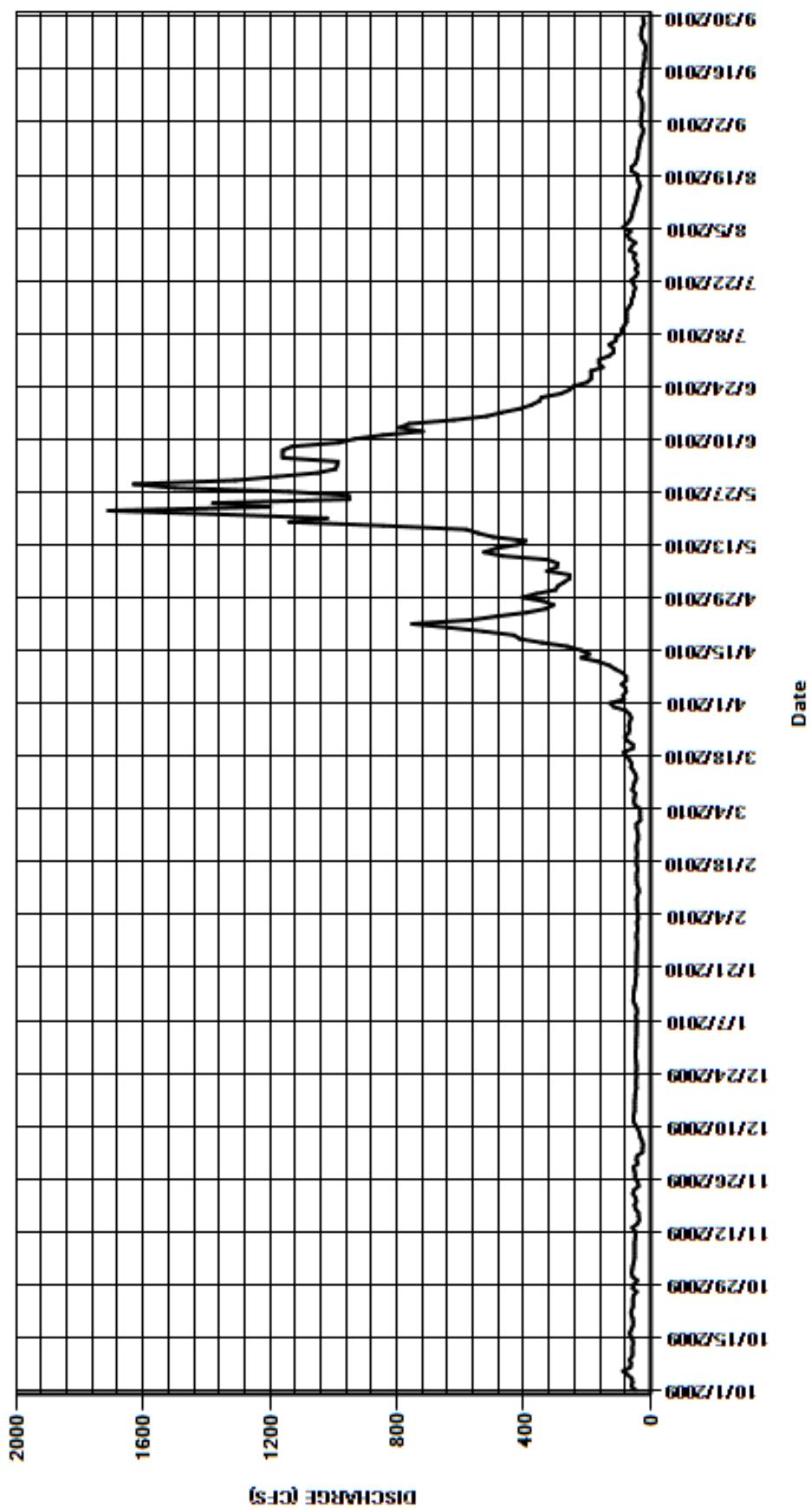
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	60	45	46	42	e32	128	e299	e1050	e163	48	30
2	61	58	43	46	43	e33	84	e293	e994	e131	67	30
3	57	56	26	45	39	e33	87	e274	e989	e116	74	30
4	59	53	26	45	40	e34	78	e256	986	118	63	29
5	72	51	24	45	42	50	79	e256	e1160	e131	88	26
6	87	51	27	44	43	53	91	327	e1160	e110	75	26
7	64	51	33	45	43	51	77	e296	e1160	109	65	26
8	62	51	35	46	44	48	77	e293	e1130	e91	59	29
9	66	51	39	43	42	58	88	324	e983	e91	58	34
10	58	49	47	44	37	54	112	468	933	e83	54	37
11	57	48	53	e49	39	51	131	525	e843	e76	51	31
12	58	49	53	55	43	45	165	487	e718	e76	46	29
13	56	58	53	54	44	47	e219	e420	e792	e76	44	30
14	56	42	50	54	44	54	e193	e394	e762	e76	41	26
15	62	36	50	52	44	62	e219	496	e621	e68	38	27
16	66	38	50	50	40	60	e262	e543	517	e60	33	24
17	61	39	50	47	44	67	e342	e581	e469	e60	38	23
18	56	48	49	47	45	77	e412	e843	e412	e53	42	20
19	55	51	48	45	44	85	e431	e1140	e376	e53	41	18
20	57	45	45	46	42	56	e526	1020	351	e48	60	19
21	61	48	46	45	44	56	e634	1350	344	e54	61	17
22	61	56	46	45	45	73	e752	1710	283	e62	48	16
23	56	52	45	45	43	81	e568	1200	256	e48	44	20
24	56	38	46	44	39	70	e485	1380	e242	e41	40	28
25	56	40	45	44	39	66	e390	950	e200	e48	40	31
26	54	50	45	43	42	69	330	952	e187	e41	38	29
27	44	49	46	42	45	66	306	1140	e187	e48	35	27
28	57	51	47	43	45	61	e338	1500	188	e54	33	21
29	52	55	47	45	---	66	e405	1630	e151	e48	30	23
30	42	40	47	44	---	78	360	1310	e163	67	25	23
31	57	---	46	41	---	116	---	1180	---	60	23	---
TOTAL	1814	1464	1352	1429	1186	1852	8369	23837	18607	2360	1502	779
MEAN	58.5	48.8	43.6	46.1	42.4	59.7	279	769	620	76.1	48.5	26
AC-FT	3600	2900	2680	2830	2350	3670	16600	47280	36910	4680	2980	1550
MAX	87	60	53	55	45	116	752	1710	1160	163	88	37
MIN	42	36	24	41	37	32	77	256	151	41	23	16

CAL YR	2009	TOTAL	73126	MEAN	200	MAX	1200	MIN	13	AC-FT	145000
WTR YR	2010	TOTAL	64551	MEAN	177	MAX	1710	MIN	16	AC-FT	128000

MAX DISCH: 2040 CFS AT 05:00 ON May. 29,2010 GH 7.04 FT. SHIFT 0.01 FT. (GH CORR. -0.01 FT. APPLIED)
 MAX GH: 7.04 FT. AT 05:00 ON May. 29,2010 (GH CORR. -0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLIAMS FORK AT MOUTH NEAR HAMILTON
WY2010 HYDROGRAPH



GREEN RIVER BASIN
POT CREEK AT UTAH-COLORADO STATELINE
Water Year 2010

Location.--	Lat. 40°40'25", Long. 109°03'03", (Hoy Mountain, Utah-Colorado Quadrangle), in Section 1, T2S, R25E Salt Lake Meridian in Daggett County, on left bank approximately 0.2 miles upstream from the Utah-Colorado state line.
Drainage and Period of Record.--	107sq mi (from topographic maps). Established September 1, 1957 by the USGS; USGS discontinued site September 30, 1982; re-established Summer 1983 by the State Engineer's Office. Staff gage installed inside well by USGS. Two outside staff gages, one on each bank, installed by State Engineer's Office.
Equipment.--	Sutron Shaft Encoder 5600-0530, housed in a 42-inch diameter corrugated metal pipe on left bank, connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Well is equipped with two 2-inch intakes with standard inside flushing devices. The primary reference gage is a staff gage inside stilling well. Supplemental outside staff gages are located on left and right banks but are not used for reference purposes. Backup chart recorder was not operational in Water Year 2010 (WY2010).
Hydrologic Conditions.--	Basin consists of moderate terrain near the gage station and originates in steep mountainous terrain in the Diamond and Uintah Mountain ranges. In the vicinity of the gage station, the channel slope is moderate with some sinuosity. The streambed is composed of sandstone and silt. Matt Warner, Calder and Crouse Reservoirs, located in Utah, all capture and control flow in Pot Creek upstream of gage. Irrigation diversions occur both upstream and downstream of the gage station and the river is subject to administration. Water was released from Crouse Reservoir to Pot Creek to satisfy a call placed by the Miles Ditch in May 2010. Flow resulting from Crouse Reservoir releases was recorded at the Pot Creek gage from May 12-25 and May 28 – June 21.
Gage-Height Record.--	Primary record is hourly data developed from the DCP data log of 15-minute observations. Continuous record kept from October 1, 2009 through September 30, 2010. The gage station was visited on 2 occasions to ensure the instruments remained calibrated. No instrument corrections were necessary this water year. Record is complete.
Datum Corrections.--	Levels have never been run by DWR personnel at this gage.
Rating.--	The control consists of an artificial weir type structure consisting of sandstone rocks grouted in place. Water pools upstream of the weir to a gage height of 0.50 ft (effective PZF=0.50 ft). Streamflow begins at gage heights exceeding 0.50 ft. Channel is straight for 100-feet upstream and bends to the left just below control before straightening for 150 feet downstream. Left bank is subject to overflow at higher stages. Right bank is almost vertical sandstone rock. Left bank covered with sagebrush and other native vegetation. This site is dry most of the year and the creek generally flows only in response to storm events, during the spring runoff period, and at times when water is released from upstream reservoirs in Utah. Due to weather constraints, the site is inaccessible during most of the year, including the late fall, winter and early spring months, which includes most periods when flow is recorded at the site. Rating No. 6 was created on November 16, 2005 and used for WY2010. Flow was recorded at the site on 41 days during WY2010: April 22-23, May 12-25, and May 28 - June 21, 2010. Zero flow (324 days) was recorded on the remaining days in WY2010. One measurement (#21) was made this year on June 2, 2010 at a flow of 3.59 cfs. Observations of zero flow were made on May 6, 2010 and October 21, 2010. The measurement and observations of zero flow cover the range in stage, except for higher daily flows recorded on May 13-15, May 31, June 8 and June 11-15, 2010. The peak flow of 13.8 cfs occurred at 1000 on May 14 at a gage height of 1.26 ft. and a shift of 0.00 ft. That peak flow exceeded the high flow measurement by 0.25 ft.
Discharge.--	Shifts were distributed by time throughout WY2010, based upon Measurement 21 and observed zero flow in WY2010.
Special Computations.--	No discharges were estimated during the flow period of WY2010.
Remarks.--	The record is considered fair throughout the record period, because only one flow measurement could be made during WY2010. Stairs to access the gage along with the surrounding platform were rebuilt on May 6, 2010. Station maintained and record developed by Jean Ray and Dan Meyer.
Recommendations.--	Levels need to be run at this site. Handrails should be added to platform.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

POT CREEK AT UTAH-COLORADO STATELINE

RATING TABLE--

PTCKSLCO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	0	3.2	0	0	0
2	0	0	0	0	0	0	0	0	3.4	0	0	0
3	0	0	0	0	0	0	0	0	3.3	0	0	0
4	0	0	0	0	0	0	0	0	3.2	0	0	0
5	0	0	0	0	0	0	0	0	3	0	0	0
6	0	0	0	0	0	0	0	0	3	0	0	0
7	0	0	0	0	0	0	0	0	3	0	0	0
8	0	0	0	0	0	0	0	0	4	0	0	0
9	0	0	0	0	0	0	0	0	3.2	0	0	0
10	0	0	0	0	0	0	0	0	3.6	0	0	0
11	0	0	0	0	0	0	0	0	4	0	0	0
12	0	0	0	0	0	0	0	1.8	5.4	0	0	0
13	0	0	0	0	0	0	0	13	8.7	0	0	0
14	0	0	0	0	0	0	0	14	6	0	0	0
15	0	0	0	0	0	0	0	11	4.2	0	0	0
16	0	0	0	0	0	0	0	1.1	3.4	0	0	0
17	0	0	0	0	0	0	0	0.57	3.1	0	0	0
18	0	0	0	0	0	0	0	0.46	3	0	0	0
19	0	0	0	0	0	0	0	0.48	3	0	0	0
20	0	0	0	0	0	0	0	0.48	1.6	0	0	0
21	0	0	0	0	0	0	0	0.58	0.16	0	0	0
22	0	0	0	0	0	0	0.05	0.64	0	0	0	0
23	0	0	0	0	0	0	0.01	0.66	0	0	0	0
24	0	0	0	0	0	0	0	0.66	0	0	0	0
25	0	0	0	0	0	0	0	0.12	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0.33	0	0	0	0
29	0	0	0	0	---	0	0	2	0	0	0	0
30	0	0	0	0	---	0	0	3.2	0	0	0	0
31	0	---	0	0	---	0	---	3.7	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.06	54.78	75.46	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	0.002	1.77	2.52	0	0	0
AC-FT	0	0	0	0	0	0	0.1	109	150	0	0	0
MAX	0	0	0	0	0	0	0.05	14	8.7	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

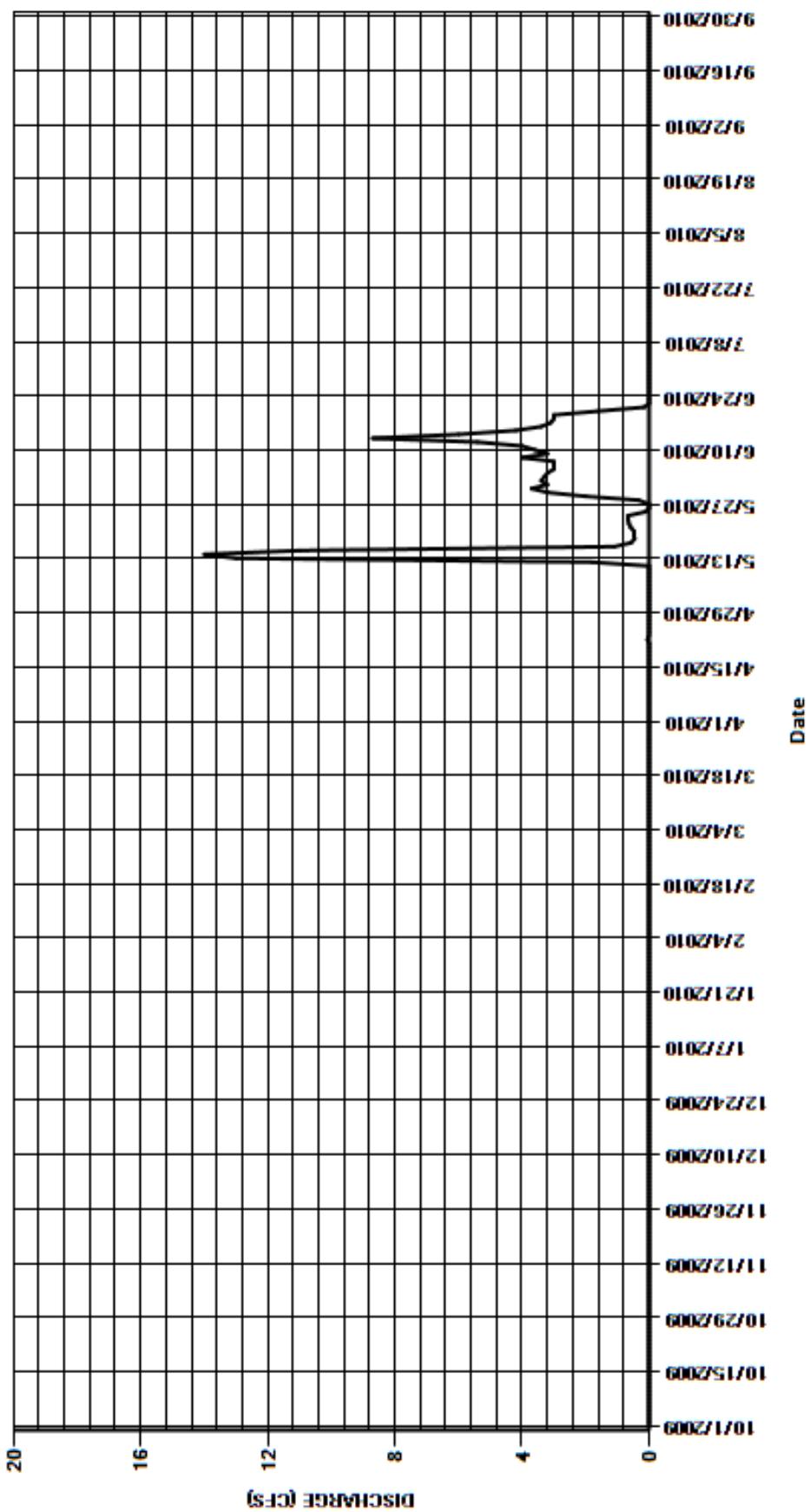
CAL YR	2009	TOTAL	106.64	MEAN	0.29	MAX	6.4	MIN	0	AC-FT	212
WTR YR	2010	TOTAL	130.30	MEAN	0.36	MAX	14	MIN	0	AC-FT	258

MAX DISCH: 13.8 CFS AT 10:00 ON May. 14,2010 GH 1.26 FT. SHIFT 0 FT.

MAX GH: 1.26 FT. AT 10:00 ON May. 14,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

POT CREEK AT UTAH-COLORADO STATELINE
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
DOLORES TUNNEL OUTLET NEAR DOLORES
Water Year 2010

Location.--	Lat. 37°28'00", Long. 108°32'30", in SW¼SE¼ sec. 18, T. 37 N., R.15 W., NMPM, Montezuma County.
Drainage and Period of Record.--	N/A
Equipment.--	Sutron Satlink 2 high data rate DCP with a shaft encoder in a concrete shelter and well. The primary reference gage is an electric drop tape. The control is a 15 ft. concrete Parshall flume located approximately 80 ft. below the outlet of the tunnel.
Hydrologic Conditions.--	Water from McPhee Reservoir is released through the Dolores Tunnel where it is outlet into a straight vertical concrete wall channel that is 25-ft wide. The converging section of the concrete Parshall flume is located approximately 80 ft. downstream of the tunnel outlet. Surging occurs in the converging section due to the close proximity of the tunnel outlet and Parshall flume.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP. The gage was visited on 12 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 2 times this water year (Mar. 17, 2010 and May 17, 2010). The adjustments made were +0.02 and -0.02 feet respectively. No flush corrections were made this water year. Record is complete and reliable for the entire period of record.
Datum Corrections.--	Levels have not been run at this gage. The datum corrections noted on the measurement sheets are corrections or confirmations of the shaft encoder readings and flush corrections made as a result of visits to the gage by State of Colorado hydrographers.
Rating.--	The control is a 15 foot concrete Parshall Flume. Moss in the flume can cause shifting. Rating 02, dated Nov. 1, 2004, was used until October 29, 2009. Rating 03, dated Oct. 29, 2009, was developed and implemented for the remainder of the water year. It is fairly well defined from 3.50 cfs to 360 cfs. Eleven measurements, Nos. 84-94, were made this year ranging in discharge from 4.96 cfs to 355 cfs. They cover the range-in-stage experienced except for the lower daily flows of Oct. 31, Nov. 2 - 19, 21-30, Dec. 1 - 28, 2009; Jan. 1 - 12, 17 - 25, 27 – 31, Feb. 1-6, 8 – 28, Mar. 1-3, 11-22, Apr. 2-3, 2010, and higher average daily flows of June 9, 2010. The peak discharge for the year of 485 cfs occurred at 1045 on May 26, 2010, at a gage height of 3.64 ft., and a shift of 0.00 ft. The gage height at that time exceeded the gage height of measurement No. 89 by 0.71 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shift Curve DOLTUNC0VS09A was used until October 29, 2009. Shift Curve DOLTUNC0VS10 was implemented at the same time as the new rating, and used for the remainder of the water year. This shift curve places all shifts at 0. Open-water measurements showed shifts varying from -0.04 to 0.06 feet. Shifts were applied directly and given full weight, except for measurement numbers 86, 88, 89, 92, and 93, which were adjusted from -2% to +4%. All measurements were adjusted to the rating. Measurement No. 89 was the high flow measurement for the water year. This measurement was a conventional measurement and rated good.
Special Computations.--	No special computations were needed this water year.
Remarks.--	Record good. Station operated and maintained by Div. 7 staff and record developed by Jason Morrow.
Recommendations.--	Levels should be run in water year 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DOLORES TUNNEL OUTLET NEAR DOLORES

RATING TABLE--

DOLTUNCO02 USED FROM 01-Oct-2009 TO 29-Oct-2009
DOLTUNCO03 USED FROM 29-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

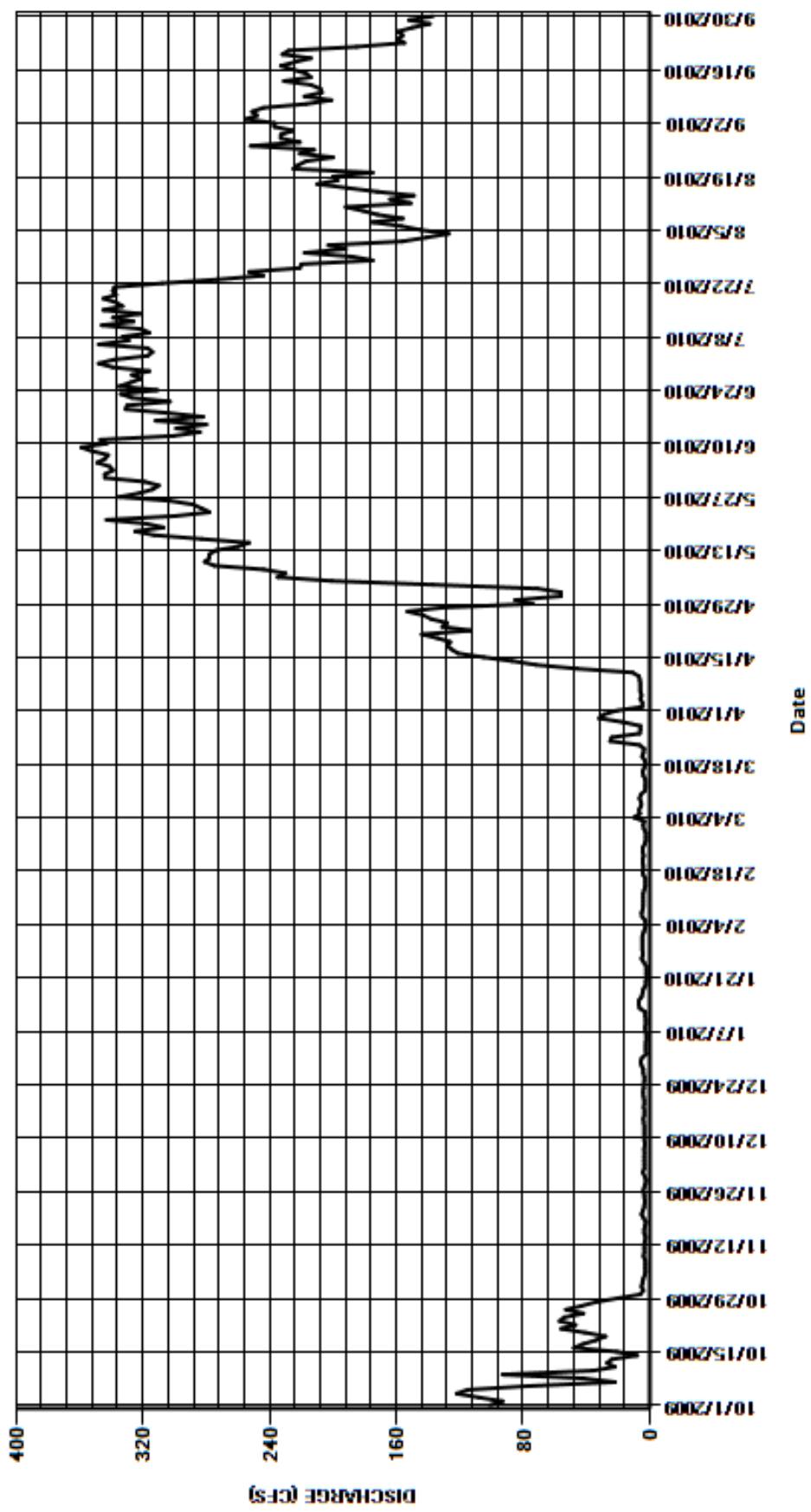
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	101	5.2	4.4	2.3	4.7	3.7	21	56	344	348	203	237
2	93	4.7	3.5	2.6	3.8	4.2	4.7	56	344	338	156	237
3	108	4.2	3.5	2.6	3	3.4	4.6	71	339	317	141	255
4	122	3.3	3.6	2.5	2.9	10	6	137	341	314	127	248
5	115	2.8	3.6	2.3	2.9	6.3	5.2	201	349	317	145	251
6	76	3	3.4	2.3	4.9	6.9	6	235	344	348	157	244
7	22	2.9	3.7	2.8	5.2	5.6	6.1	230	342	329	175	217
8	42	3	3.2	2.9	4.4	5.5	6.1	244	352	333	156	201
9	93	4	3.4	2.6	4.2	6.5	6.3	275	359	316	172	218
10	36	3.5	3.5	2.6	4.2	5.7	6.9	281	343	321	181	207
11	22	3.5	3.5	2.9	4.2	3.1	11	278	347	346	192	208
12	27	3.7	3.5	2.9	4.2	2.8	46	278	301	326	151	214
13	24	3.1	3.5	6.4	3.6	2.7	72	274	284	339	164	231
14	8	2.7	3.8	7	2.9	2.9	87	260	299	322	149	214
15	21	3.6	4.1	7	2.9	4.1	105	253	280	345	172	217
16	48	3.6	3.5	5.2	2.8	4.5	121	283	312	333	191	225
17	42	3	3.4	4.6	4.2	3.6	125	313	282	337	210	233
18	34	2.6	3.8	4.1	4.6	2.7	128	325	304	345	197	224
19	28	3.9	3.6	2.6	4	3.3	126	307	331	337	200	214
20	41	5.2	3.6	2.5	4.4	4.9	134	318	330	339	175	232
21	56	4.3	4	2.3	4.6	4	144	343	303	338	225	228
22	47	3.5	4.2	2.3	3.9	3.6	113	300	327	308	222	185
23	57	3.3	3.9	2.3	4.5	6.5	131	278	334	273	217	155
24	54	3.4	3.9	2.3	4.6	25	128	283	311	244	200	159
25	42	3.5	3.5	3.8	3.3	24	138	288	335	253	221	156
26	53	4.2	3.5	5.2	2.6	6.4	143	303	328	221	212	159
27	43	3.6	4.1	4.3	2.6	6	153	335	321	220	252	150
28	34	2.8	4.1	4.6	2.6	5.9	131	322	327	175	221	139
29	20	2.4	5.2	4.6	---	17	74	314	316	188	233	152
30	6.1	3.4	5.9	4.6	---	32	85	310	339	218	233	137
31	4.1	---	5	4.6	---	29	---	319	---	192	225	---
TOTAL	1519.2	105.9	119.4	111.6	106.7	251.8	2267.9	8070	9768	9280	5875	6147
MEAN	49	3.53	3.85	3.6	3.81	8.12	75.6	260	326	299	190	205
AC-FT	3010	210	237	221	212	499	4500	16010	19370	18410	11650	12190
MAX	122	5.2	5.9	7	5.2	32	153	343	359	348	252	255
MIN	4.1	2.4	3.2	2.3	2.6	2.7	4.6	56	280	175	127	137
CAL YR	2009	TOTAL	47723.4	MEAN	131	MAX	394	MIN	2.4	AC-FT	94660	
WTR YR	2010	TOTAL	43622.5	MEAN	120	MAX	359	MIN	2.3	AC-FT	86530	

MAX DISCH: 485 CFS AT 10:45 ON May. 26,2010 GH 3.64 FT. SHIFT 0 FT.

MAX GH: 3.64 FT. AT 10:45 ON May. 26,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES TUNNEL OUTLET NEAR DOLORES
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
Water Year 2010

Location.--	Lat. 37°30'24", Long. 108°35'28", in NW¼SW¼ sec. 35, T.38 N., R.16 W., NMPM, Montezuma County.
Drainage and Period of Record.--	N/A
Equipment.--	Sutron 8210 high data rate DCP and an analog shaft encoder in a concrete shelter and well. Shaft encoder is set to outside staff gage. Control is a 12-foot concrete Parshall flume. A foot bridge located at the throat of the flume where a bridge crane is used to make high flow measurements. No changes this water year.
Hydrologic Conditions.--	The canal is filled by gravity from McPhee Reservoir. The channel upstream and downstream of the Parshall flume is straight. At high flows ($GH > 2.50\text{-ft}$) the canal surges and the approach velocity to the flume is fast. During the water year, some moss does grow in the channel above the flume and on the flume floor itself.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with satellite data used for backup purposes. This year downloaded data was absent from the 8210 for some of the water year, therefore a complete data set of satellite data was used for the final gage height record. Upon station inspection on 4/7/10, it was discovered that the shaft encoder tape had become dislodged from the pins on its wheel. When the tape was placed back on the pins, a gage height correction of -0.04 ft was shown. The tape has been known to come off of its pins when the water level within the stilling well changes rapidly. The date of 12/7/09 was identified as a probable time of when the tape came off of its pins as the gage height changed from 0.64 ft. to 2.12 ft. within one hour at noon. Changes in gage height were recorded for the period when the tape was off the pins indicating that the tape was able to still move the shaft encoder wheel with changes in stage. A datum correction of -0.04 ft. was applied to the gage height record between 12/7/09 and 4/7/10, which is an appropriate correction because there were periods when the canal did not flow between those dates and the shaft encoder showed a stage of 0.23 ft. (0.19 ft. - 0.20ft. is a 0 discharge on the rating) so the correction brought the flow back to zero. A datum correction of -0.04 ft. was applied to the shaft encoder on 8/6/10 to match the outside staff gage. Gage height record is complete and reliable except for 12/7/09 through 4/7/2010 which has been rated 'e-' due to equipment problems noted above.
Datum Corrections.--	Levels were run after the water year ended on 10/6/10. This was the first time levels have been run at this site. BM#1 was established as the floor of the flume at the outside staff gage as 0.00 ft. elev. There is no physical reference point within the gage house. An electric tape is planned to be installed in WY11. The top of the instrument shelf inside the gage house was found to be 9.78 ft above BM#1. No corrections were made to the record in WY10.
Rating.--	A 12-ft. concrete Parshall flume table (MVIDIVCO01 dated June 15, 1971) was used until 2/18/2010. After reviewing the measurements in WY10, rating 03 (MVIDIVCO03 dated 10/8/2010) was developed for record purposes and transitioned into the record on 2/18/2010. Rating 02 (MVIDIVCO02 dated 5/29/2010) was developed during the water year, based on WY09 measurements, and instituted during the water year for real-time administration. Subsequent measurements in WY10 were not close to the rating. Rating 02 was not used for any record purposes. Rating 03 is fairly well defined from 20 cfs to 475 cfs. Fourteen discharge measurements (Nos. 75-88) were made this year ranging in discharge from 18.3 cfs to 360 cfs. An observation of 0 flow was made on April 7, 2010 covers the lower range in discharge. Measurements cover the higher range-in-stage except for the average daily flow of May 27, 2010. The peak flow of 385 cfs occurred at 0800 on 5/27/2010 at a gage height of 3.58 ft. with a shift of 0.00 ft. The peak flow exceeded high measurement 79 ($GH = 3.49\text{ ft.}$) by 0.09 ft. in stage.
Discharge.--	Shifts for WY10 were applied by time for the entire water year. Rating 03 (MVIDIVCO03) was developed using measurements from WY10. All measurements made (76 through 88) after rating 03 was implemented were shifted back to the rating. Measurements were discounted -7% to +7%. Measurements made (75 and 76) within rating 01 period were discounted -4% to +2% to smooth the shift distribution. It was shown in WY10 that measurement at the gage within the flume showed a trend of positive shifts while measurements (when possible) within the channel above the flume would show less positive to negative shifts, even with measurements performed in succession on the same day. Open-water measurements showed shifts varying between -0.09 feet (rating 03) and +0.06 feet (rating 03). No shifts were applied directly and given full weight. All shifts were discounted (measurement nos. 75-88) from -7% to 7%.
Special Computations.--	The dates of 12/7/2009 through 4/7/2010 were deemed to have an 'e'-day rating and a -0.04 ft. datum correction for this entire period was determined from resetting the tape on the shaft encoder wheel and generating a difference of -0.04 ft. from before to after.
Remarks.--	Record is 'fair' for the entire period except for December 7, 2009 through April 7, 2010 which is rated 'poor' due to the shaft encoder tape being dislodged, but still generating data. A 'fair' rating was given due to the uncertain relationship between stage and discharge as demonstrated through measurements at and above the gage, even in succession on the same day and same stage, showing a broad range in discharge.
Recommendations.--	An electric tape or drop tape should be installed. A station visit should be performed after all significant changes in water stage to ensure the tape on the shaft encoder has not migrated from its pins on the wheel. Multiple measurements on the same day with the same stage should be performed in order to better determine the stage-discharge relationship at the gage. Station maintained and record developed by Brian Leavesley.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES

RATING TABLE--

MVIDIVCO01 USED FROM 01-Oct-2009 TO 18-Feb-2010
MVIDIVCO03 USED FROM 18-Feb-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

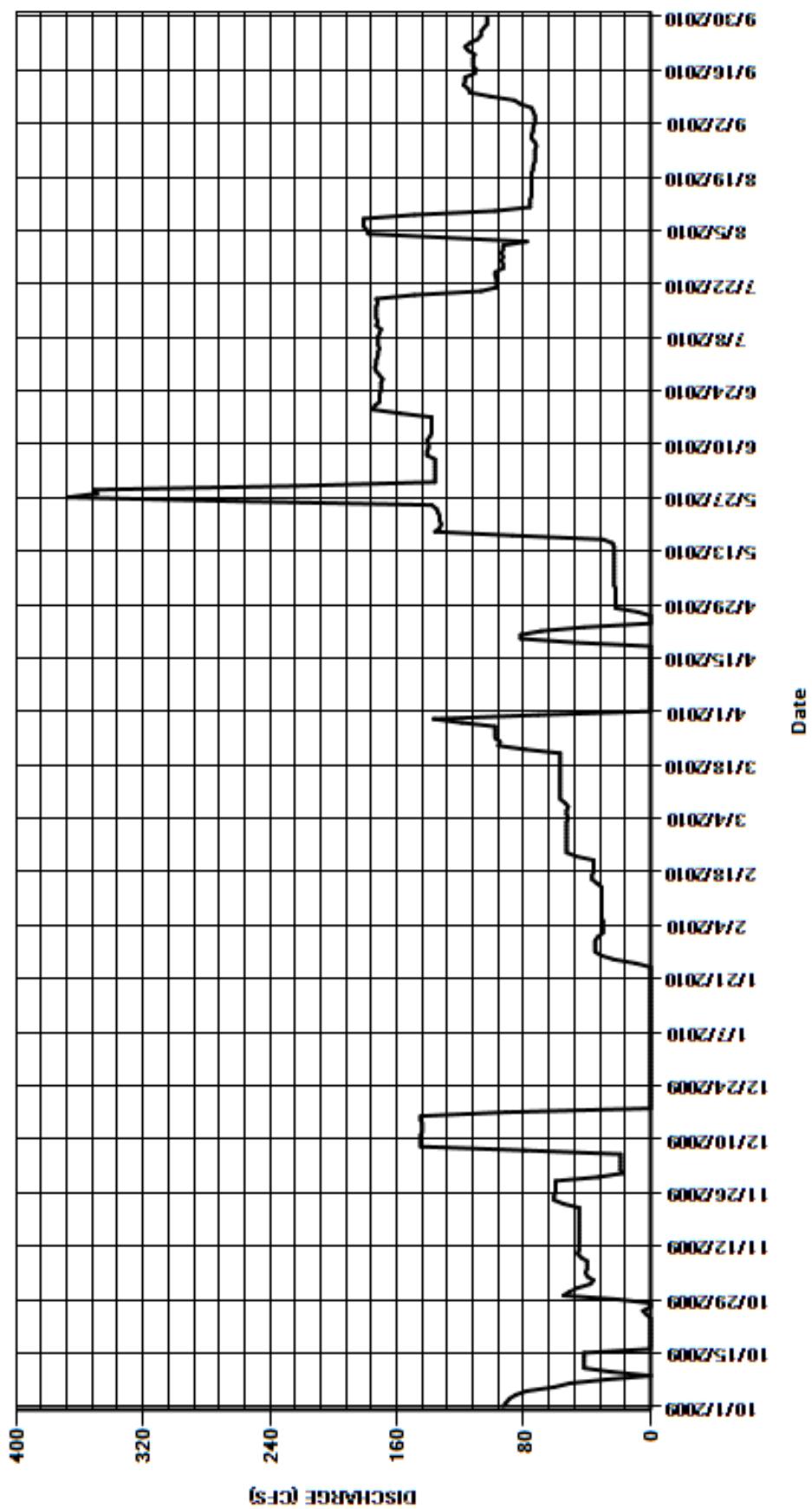
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	46	18	e0	e33	e53	e0	22	136	173	93	74
2	91	38	19	e0	e30	e53	e0	22	136	173	78	73
3	89	36	19	e0	e30	e53	e0	22	136	172	129	73
4	85	40	19	e0	e30	e52	e0	23	136	172	178	73
5	78	41	19	e0	e30	e53	e0	23	136	171	179	74
6	61	40	19	e0	e31	e53	e0	23	136	172	181	75
7	51	40	e79	e0	e31	e52	e0	23	141	172	181	82
8	28	40	e145	e0	e31	e54	0	23	141	172	181	86
9	0	44	e145	e0	e31	e57	0	23	140	171	149	101
10	25	46	e145	e0	e31	e57	0	23	140	170	98	114
11	42	45	e145	e0	e31	e57	0	23	141	173	76	115
12	42	45	e144	e0	e31	e57	0	23	139	172	76	118
13	42	45	e144	e0	e31	e57	0	23	138	173	76	117
14	42	45	e144	e0	e31	e57	0	23	138	173	75	117
15	42	45	e145	e0	e34	e57	0	24	138	173	75	111
16	0.23	45	e145	e0	e37	e57	0	30	138	173	75	110
17	0	45	e91	e0	e37	e57	0	87	138	172	75	112
18	0	45	e0	e0	e36	e57	0	136	158	173	75	112
19	0	45	e0	e0	e36	e57	48	133	175	149	75	112
20	0	45	e0	e0	e36	e57	82	132	174	107	75	111
21	0	45	e0	e0	e36	e57	82	133	171	97	74	115
22	0	45	e0	e0	e47	e79	69	133	171	97	74	117
23	0	55	e0	e0	e53	e96	42	134	171	97	73	114
24	0	61	e0	e0	e53	e95	0	135	170	98	73	109
25	2.6	61	e0	e9.6	e53	e98	0	138	170	98	73	107
26	4.9	60	e0	e23	e53	e98	0	261	170	93	73	107
27	0	60	e0	e31	e53	e98	8	368	169	93	72	105
28	0	60	e0	e35	e53	e98	22	349	171	94	73	103
29	21	60	e0	e35	---	e119	22	351	173	93	75	103
30	55	33	e0	e35	---	e137	22	224	174	94	75	103
31	51	---	e0	e35	---	e71	---	136	---	93	74	---
TOTAL	945.73	1401	1585.00	203.60	1049	2153	397.00	3223	4565	4403	3009	3043
MEAN	30.5	46.7	51.1	6.57	37.5	69.5	13.2	104	152	142	97.1	101
AC-FT	1880	2780	3140	404	2080	4270	787	6390	9050	8730	5970	6040
MAX	93	61	145	35	53	137	82	368	175	173	181	118
MIN	0	33	0	0	30	52	0	22	136	93	72	73
CAL YR	2009	TOTAL	29390.03	MEAN	80.5	MAX	422	MIN	0	AC-FT	58300	
WTR YR	2010	TOTAL	25977.33	MEAN	71.2	MAX	368	MIN	0	AC-FT	51530	

MAX DISCH: 385 CFS AT 08:00 ON May. 27,2010 GH 3.58 FT. SHIFT 0 FT.

MAX GH: 3.58 FT. AT 08:00 ON May. 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
WY2010 HYDROGRAPH



DOLORES RIVER BASIN
DOLORES RIVER BELOW MCPHEE RESERVOIR
Water Year 2010

Location.--	Lat. 37°34'33", Long. 108°34'33", in SE ¼ SE ¼ sec. 2, T.38 N., R.16 W., NMPM, Montezuma County.
Drainage and Period of Record.--	819 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink HDR DCP with a shaft encoder on separate floats in a 60"x 60" cast concrete shelter and well. Primary reference is an electric drop tape inside the gage house. The gage house is equipped with AC power. Control is a 15-foot concrete Parshall flume with flat wing walls that extend the width of the channel and act as the 2nd stage control.
Hydrologic Conditions.--	Large rocks and cobble line the channel above and below the 15-ft concrete Parshall flume. Silt deposits typically do not occur at this gage since the gage is directly below McPhee Reservoir. Heavy moss growth on the control and in the channel above the control affects the stage-discharge relationship during the summer months. Below a gage height of 3.00 the rating follows a standard 15-ft Parshall flume rating. If all the moss were removed from the flume (usually after a high flow event) shifts are generally positive due to the seepage under the wing walls. As moss grows in the flume shifts tend to be more negative.
Gage-Height Record.--	The primary record is hourly averages of 15-minute data downloaded from the DCP with chart record used for backup purposes. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted one time this water year (Nov. 9, 2009) with a -0.02 ft shaft encoder correction. Record from the DCP is complete and reliable.
Datum Corrections.--	Levels were run this water year on Sep. 29, 2010 using BM No. 1 as base. The ET index was found to be reading -0.002 feet low. No corrections were made since the ET index was within the allowable error tolerances. Levels were also run to the three other reference marks (RM#2, RM#3 and RM#4). RM#2 was found to be reading -0.003 feet low. RM#3 was found to be reading -0.004 feet low and RM#5 was found to be reading -0.003 feet low. No changes were made to the reference marks.
Rating.--	The control is a 15 foot Parshall Flume with flat wing walls extending 50 ft in both directions. Rating DOLBMCCO04A, dated Nov. 9, 2004, was used the entire water year. Below 3.00 ft the rating follows the general form of a standard Parshall flume. It is fairly well defined from 13 cfs to 5,580 cfs. Seventeen measurements, Nos. 200 - 216, were completed this year ranging in discharge from 27.4 cfs to 792 cfs. They cover the range-in-stage experienced except for the lower average daily flow on Nov. 3, 2009 and the higher average daily flows of May 27-31, June 1, 2, 5-7, 2010. The peak instantaneous flow of 1500 cfs occurred at 2045 on June 6, 2010 at a gage height of 4.94 ft with a shift of +0.01 ft. It exceeded the stage of measurement No. 206, made May 27, 2010 by 0.87 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time with consideration of stage from 0000 October 1, 2009 until November 9, 2009 at 1055. The control is very stable and moss growth during the winter to early summer is low, therefore a variable shift is used to describe the stage discharge relationship during this period. Variable shift curve DOLBMCCOVS10 was used from 1100 November 9, 2009 to July 7, 2010 at 1219. Heavy moss growth defined the shifts the remainder of the water year. Shifts were prorated by time as defined by measurement Nos. 209 to 216, from July 7, 2010 at 1300 until the end of the water year. Measurements show shifts varying from -0.17 ft to +0.05 ft. All shifts were given full weight except for measurement Nos. 204, 208 (not used), 209, 210, 211, 213, 214, and 215, which were discounted from -4% to 5% to smooth the shift distribution. Measurement No. 208 was not used. It was made with an ADCP in the converging section of the Parshall flume. Water leaks under the flume causing the instrument to under register the total flow. Measurement No. 212 was not completed. The batteries on the Flow Tracker became too low and measurement data was lost.
Special Computations.--	On two separate occasions during the water year moss was removed from the concrete Parshall flume. On the first instance, October 13, 2009, the gage height dropped 0.08 ft after the moss was removed. On the second instance, September 2, 2010, the gage height dropped 0.13 ft. Conditions in which moss significantly affects gage height can be considered to prevail during the summer months prior to either moss removal event. After July 7, 2010 the measurements indicate a larger deviation from the rating. Moss growth is rampant at this gage from early summer to late fall. Shifts were distributed by time, between measurements in an attempt to model moss growth. In the late summer months the large cobble channel is choked with heavy moss. The velocities in the gage pool above the control are very slow as well. Heavy moss and slow velocities make for poor measurement conditions. On June 17, 2010 two measurements were made (#207 and #208) – one in the Parshall flume and one in the cobble section approximately 100-ft above the Parshall flume. Results indicate that at medium-flow conditions a significant amount of flow (11%) seeps beneath the control. At these conditions measuring should occur in the upstream cobble channel. However, at low-flow conditions the cobble channel upstream of the flume is a poor section and it is assumed that leakage beneath the flume is negligible due to low head conditions. At these conditions, measuring in the flume is adequate.
Remarks.--	Record is complete and good. Station maintained by Div 7 staff and record developed by Jason Morrow.
Recommendations.--	Currently no recommendations have been made this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DOLORES RIVER BELOW MCPHEE RESERVOIR

RATING TABLE--

DOLBMCCO04A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	191	28	28	30	30	32	32	56	963	75	76	48
2	36	28	28	30	30	33	31	63	822	75	77	48
3	35	27	28	30	30	34	31	67	610	75	77	48
4	35	28	28	30	30	34	31	67	486	75	77	48
5	35	28	28	30	30	34	30	67	1030	75	77	48
6	35	29	28	30	30	34	30	67	1270	75	77	48
7	35	29	29	30	30	34	30	67	1220	75	78	48
8	34	29	30	30	30	34	30	67	789	76	78	48
9	34	28	30	30	30	33	30	67	619	75	78	49
10	34	28	30	30	30	34	30	62	429	75	78	51
11	34	28	30	30	30	34	31	60	244	74	77	43
12	34	28	30	30	30	34	30	60	98	74	76	42
13	37	28	30	30	30	34	30	60	88	73	76	42
14	39	29	30	30	30	34	30	60	79	73	76	42
15	37	29	30	30	32	34	30	60	75	72	76	42
16	37	28	30	30	30	34	30	60	75	72	63	43
17	37	28	30	30	30	34	30	60	75	72	49	43
18	37	33	30	30	30	33	30	60	72	72	49	43
19	37	28	30	30	30	33	30	60	70	71	49	43
20	36	28	30	30	30	33	30	60	70	70	50	42
21	36	28	30	30	30	33	30	54	70	68	50	42
22	36	28	30	30	30	33	31	54	70	68	50	43
23	36	28	30	30	30	33	31	54	70	72	50	42
24	36	28	30	30	30	33	31	159	74	75	49	42
25	36	28	30	30	30	33	31	507	76	75	49	42
26	36	28	30	30	30	33	31	749	76	75	49	42
27	36	28	30	30	30	33	31	793	76	76	49	42
28	36	28	30	30	30	33	31	793	76	76	49	42
29	36	28	30	30	---	33	31	793	75	76	49	42
30	36	28	30	30	---	33	45	912	75	76	49	171
31	36	---	30	30	---	33	---	1040	---	76	49	---
TOTAL	1265	849	917	930	842	1036	929	7158	9922	2287	1956	1459
MEAN	40.8	28.3	29.6	30	30.1	33.4	31	231	331	73.8	63.1	48.6
AC-FT	2510	1680	1820	1840	1670	2050	1840	14200	19680	4540	3880	2890
MAX	191	33	30	30	32	34	45	1040	1270	76	78	171
MIN	34	27	28	30	30	32	30	54	70	68	49	42

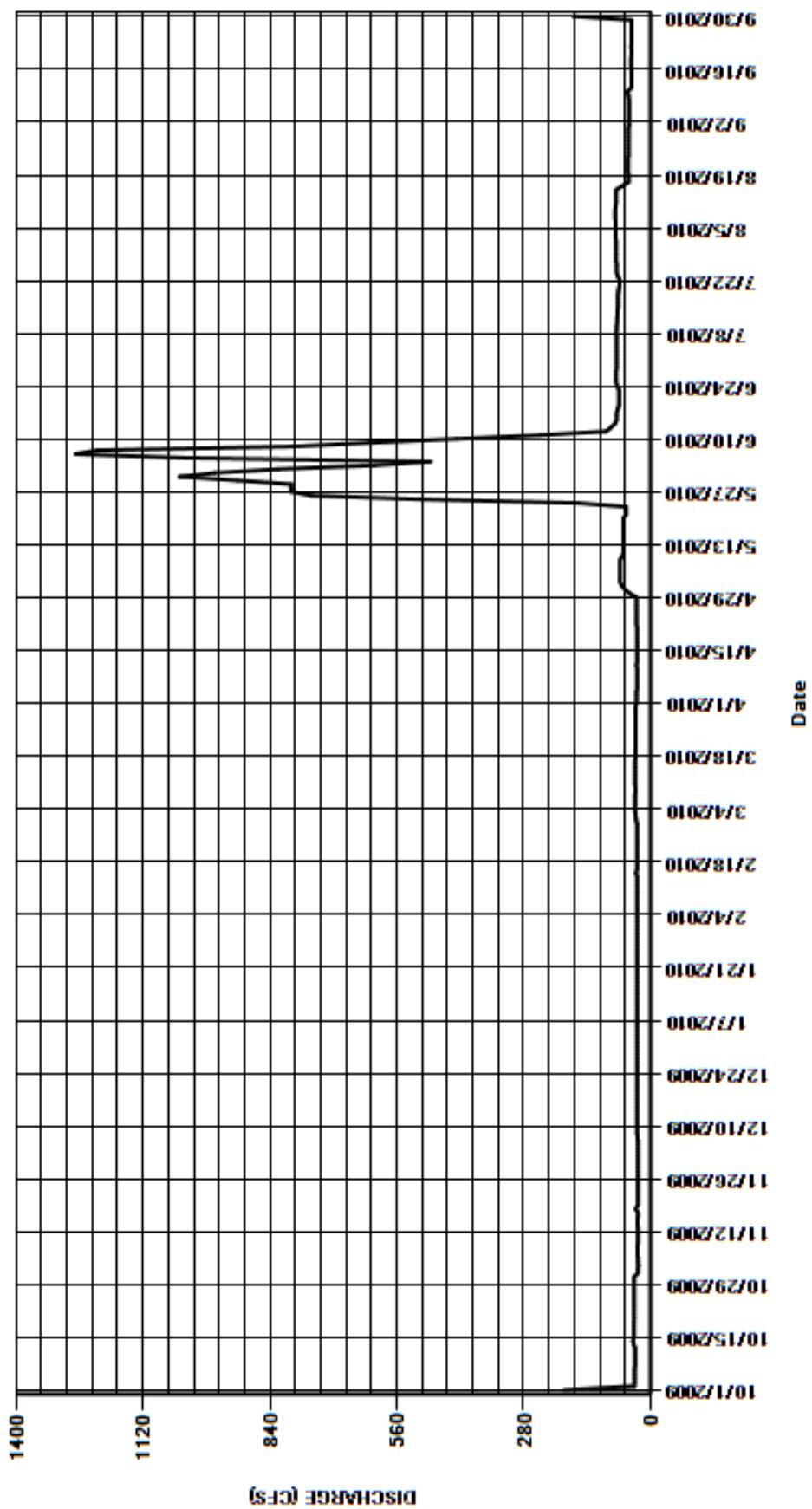
CAL YR	2009	TOTAL	42888	MEAN	118	MAX	2050	MIN	27	AC-FT	85070
WTR YR	2010	TOTAL	29550	MEAN	81	MAX	1270	MIN	27	AC-FT	58610

MAX DISCH: 1500 CFS AT 20:45 ON Jun. 06,2010 GH 4.94 FT. SHIFT 0.01 FT.

MAX GH: 4.94 FT. AT 20:45 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES RIVER BELOW MCPHEE RESERVOIR
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
BLANCO DIVERSION NEAR PAGOSA SPRINGS
Water Year 2010

Location.--	Lat. 37°12'13", Long. 106°48'35", in NW ¼ NE ¼ sec. 11, T.34 N., R.1 E., NMPM, Archuleta County.
Drainage and Period of Record.--	N/A
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with shaft encoder. The shaft encoder and graphic recorder are on separate floats in a concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 12-ft concrete Parshall flume set in an underground concrete box culvert. No changes this water year.
Hydrologic Conditions.--	The diversion is the beginning of the Blanco Tunnel. The Blanco Tunnel is the first leg in the trans-mountain diversion of the San Juan / Chama project. Cobble, gravel, and silt are deposited in the box culvert above the Parshall flume. The hydraulic conditions cannot be directly observed since the structure is located underground.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 9 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted once this water year by -0.02 ft. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable.
Datum Corrections.--	Levels were not run in WY 2009. It is unknown when levels were last run at the gage.
Rating.--	The control is a twelve-foot Parshall flume. The Parshall flume is located underground and approximately 50 to 80 ft downstream of the radial gates. The only access point is located at the radial gates. One channel at all stages. Rating No. 1 was used the entire water year. Rating No. 1 is a standard twelve foot Parshall flume rating above a gage height of 0.06-ft. Flows below a gage height of 0.06-ft are assumed to be negligible and ignored. No discharge measurements have ever been made at the gage due to safety concerns. The peak instantaneous flow of 532 cfs occurred at 1400 June 26, 2009 at a gage height of 4.57 ft with a shift of 0.00 ft.
Discharge.--	No discharge measurements are made at this gage since the control structure is located underground. The standard 12-ft Parshall flume rating was applied directly to the gage height record to calculate the discharge.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	The record is good. Station maintained by Brian Boughton and record developed by Brian Leavesley.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BLANCO DIVERSION NEAR PAGOSA SPRINGS

RATING TABLE--

BLADIVCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

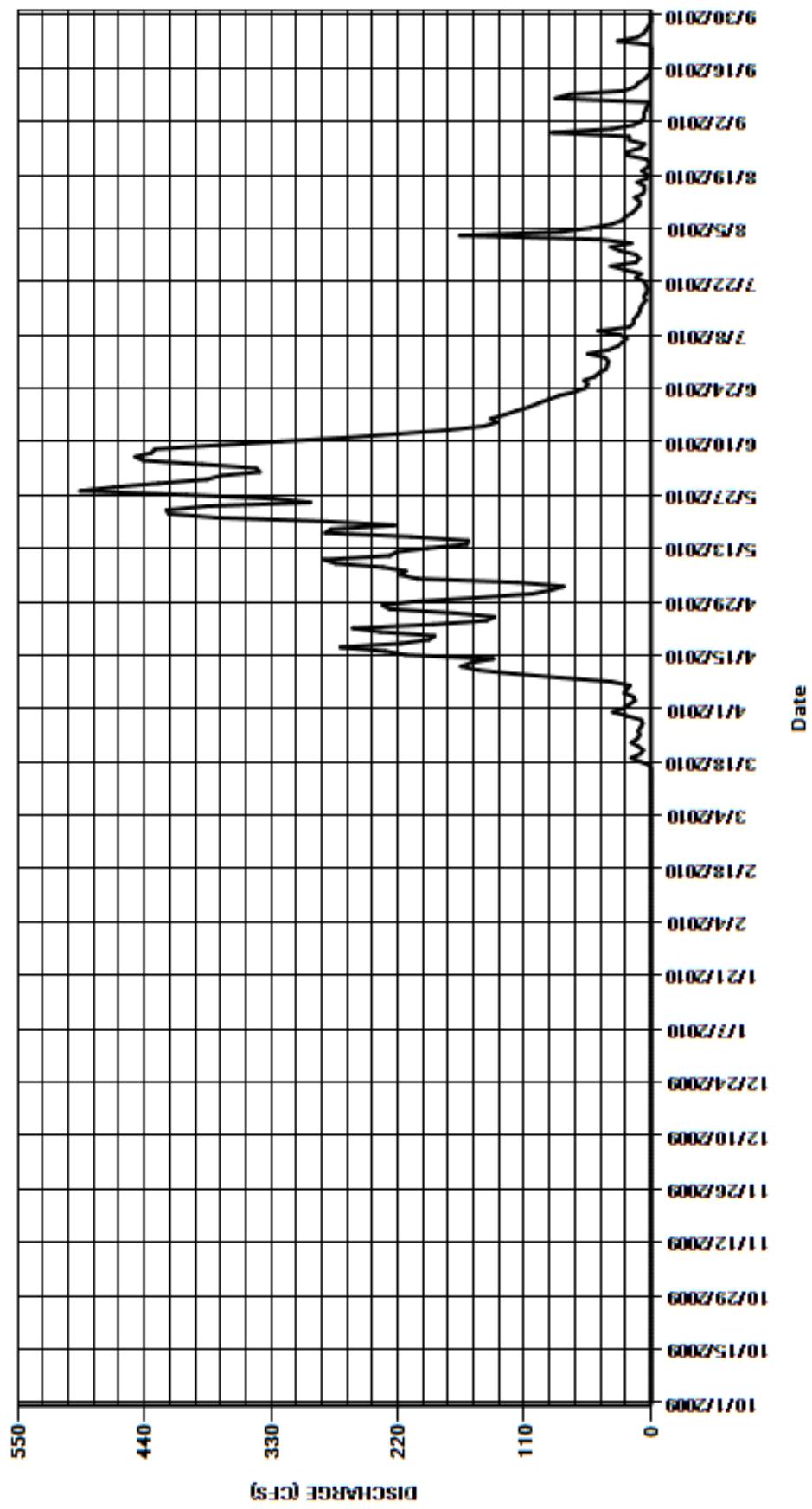
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	24	104	374	37	17	15
2	0	0	0	0	0	0	19	87	340	40	44	8.5
3	0	0	0	0	0	0	14	76	343	55	166	6.1
4	0	0	0	0	0	0	15	116	390	37	78	6.3
5	0	0	0	0	0	0	23	203	441	29	52	4.7
6	0	0	0	0	0	0	21	218	448	25	34	3.3
7	0	0	0	0	0	0	18	213	434	21	25	0.71
8	0	0	0	0	0	0	35	233	431	27	22	83
9	0	0	0	0	0	0	78	274	377	46	16	71
10	0	0	0	0	0	0	118	284	321	19	13	23
11	0	0	0	0	0	0	150	227	264	15	10	14
12	0	0	0	0	0	0	165	221	219	15	10	11
13	0	0	0	0	0	0	156	194	176	12	14	5.6
14	0	0	0	0	0	0	137	160	145	10	7	2.5
15	0	0	0	0	0	0	213	159	134	9.2	5.6	1
16	0	0	0	0	0	0	231	208	139	7.3	5.8	0.5
17	0	0	0	0	0	1.3	270	283	127	4.8	12	0.21
18	0	0	0	0	0	9.2	217	278	117	6.2	3.8	0.15
19	0	0	0	0	0	17	193	223	106	3.9	3.4	0
20	0	0	0	0	0	9.3	188	280	98	3.2	8	0
21	0	0	0	0	0	6.8	235	378	89	4.4	2.6	0
22	0	0	0	0	0	11	259	419	80	6.1	1.4	0.71
23	0	0	0	0	0	17	189	421	66	e13	4	29
24	0	0	0	0	0	12	143	386	57	8.6	20	12
25	0	0	0	0	0	9.7	136	296	55	23	20	6.4
26	0	0	0	0	0	11	171	328	58	35	9	4.2
27	0	0	0	0	0	9.2	227	404	49	13	5.6	2.1
28	0	0	0	0	0	7.2	233	496	45	10	19	0.26
29	0	0	0	0	---	8.8	206	467	39	13	19	0.21
30	0	0	0	0	---	21	152	428	38	27	86	0.8
31	0	---	0	0	---	33	---	386	---	35	34	---
TOTAL	0.00	0.00	0.00	0.00	0.00	183.50	4236	8450	6000	610.7	767.2	312.25
MEAN	0	0	0	0	0	5.92	141	273	200	19.7	24.7	10.4
AC-FT	0	0	0	0	0	364	8400	16760	11900	1210	1520	619
MAX	0	0	0	0	0	33	270	496	448	55	166	83
MIN	0	0	0	0	0	0	14	76	38	3.2	1.4	0
CAL YR	2009	TOTAL	24066.92	MEAN	65.9	MAX	475	MIN	0	AC-FT	47740	
WTR YR	2010	TOTAL	20559.65	MEAN	56.3	MAX	496	MIN	0	AC-FT	40780	

MAX DISCH: 519 CFS AT 20:30 ON Jun. 07,2010 GH 4.5 FT. SHIFT 0 FT.

MAX GH: 4.5 FT. AT 20:30 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLANCO DIVERSION NEAR PAGOSA SPRINGS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
Water Year 2010

Location.--	Lat. 37°12'13", Long. 106°48'42", in NW 1/4 sec. II, T.34 N., R.1 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 250 ft downstream from Blanco Diversion Dam, 1.1 mi downstream from Leche Creek, and 12 mi southeast of Pagosa Springs.
Drainage and Period of Record.--	69.1 mi ² . March 1971 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with shaft encoder was used until 5/20/2010 when the shaft encoder was replaced with a Sutron stage discharge recorder (SDR). The shaft encoder/SDR and graphic recorder are on separate floats in a 48-inch by 48-inch concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 4-ft steel Parshall flume set in a concrete structure that acts as a weir at high flows. No other changes this water year.
Hydrologic Conditions.--	Cobble, gravel, and silt are deposited in the stilling pool above the control. Once a year, or at least every other year, the USBR removes the deposits above the control section. Approximately 250 feet above the control is a USBR diversion dam for the SanJuan/Chama Project.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 17 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 2 separate occasions this water year. All adjustments made were ±0.01feet. The gage is visited almost daily (during normal business hours) by the USBR-Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 10-11, 13-21, 24-25, 2009, Jan. 29 – Feb. 3, 11-18, 2010 .
Datum Corrections.--	Levels were last run on October 14, 2010. Levels were run to the inside gage (ET index) using RM#1 as the base. The survey did not close within the allowable error. Levels will need to be run again in water year 2011. No corrections were made to the electric tape index and electric tape length.
Rating.--	The control is a four-foot Parshall flume installed in December 1979 to replace a v-notch weir. At an elevation of 3.00 feet, horizontal concrete wing walls extend in both directions for a total of 76 feet. There is one channel at all stages. Rating No. 6, dated Feb. 1, 2001, continued to be used this year. Rating No. 6 is based on the general shape of a four foot Parshall flume theoretical rating, and is the same as Rating No. 5, dated Dec. 26, 1985, above 3.00 feet. It is fairly well defined from 4.0 to 211 cfs. Fourteen measurements (Nos. 791 – 804) were made during this water year ranging in discharge from 17.6 to 42.1 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 1-6, Nov. 30, Dec. 2-31, 2009; Jan. 1 – Mar. 4, 6, 9-12, Sep. 4-6, 19-21, 2010, and the higher average daily flows of Oct. 8, 2009; May 2, 4, 6-9, 12, 13, 15-18, 21, 23, 27-31, Jun. 5-7, Aug. 3, Sep. 22-23, 2010. The peak instantaneous flow of 753 cfs occurred at 0300 on Aug. 3, 2010 at a gage height of 4.17 ft with a shift of +0.02 ft. It exceeded the stage of measurement No. 796, made May 3, 2010 by 2.35 feet in stage.
Discharge.--	Shifting section control method was used for all periods of good record. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls at flows above gage height of 2.70 ft. The approach sections and the wing walls are periodically cleaned by the USBR or State of Colorado employees and are noted on the chart. Shifts were applied as defined by measurements, flow events, and cleaning of the channel above the flume and were distributed by time for the entire period of record. A +0.03 ft. shift was used from 0000 Oct. 01, 2009 through 0800 Mar. 29, 2010 at which time it was assumed the USBR began to remove silt from the stilling pool upstream of the flume. Shifts were distributed by time (+0.03 ft. to 0.00 ft.) from 0900 Mar. 29 until 1500 Mar. 29 when the channel above the flume was cleaned. A measurement made on Mar. 30 indicated the channel was cleaned and the shift changed accordingly (0.00 ft. shift). The shift was prorated by time from 1600 Mar. 30 to 1555 Apr. 14 when another measurement took place (0.00 ft. to +0.02 ft. shift). A +0.02 ft. shift was applied until 2030 Apr. 30 when release above the flume increased very rapidly. A +0.03 ft. shift was applied straight to next measurement at 1624 May 3. Shift was prorated by time between measurements to 1139 May 20 (+0.03 ft. to +0.04 ft. shift). The +0.04 ft. shift was carried to 2330 May 28 to asymptotic peak of overflow from diversion above where +0.05 ft. shift started. The +0.05 ft. shift carried to next asymptotic peak of overflow at 2115 Jun. 6 when +0.06 ft. shift began. The +0.06 ft. shift carried straight to the beginning of a major storm event on 0000 Aug. 3. It was assumed that sediment was transported from in front of flume on the rising limb of the hydrograph to the peak and caused the shift to change from +0.06 ft. to +0.01 ft. The +0.01 ft. shift carried straight to 1130 Sep. 8 when 5+ hour release event from diversion dam above deposited sediment in front of flume. The shift was prorated by time over the receding limb of the hydrograph to 1400 Sep. 8 (+0.01 ft. to +0.03 ft. shift). The +0.03 ft. shift was carried straight through end of water year. A measurement on Oct 14, 2010 showed a shift of 0.00 ft., however, there was a storm release event before then on October 8, that the +0.03 ft. shift will be carried into water year 2011. It was assumed the weir pool was cleaned on Mar. 29, 2010. Discharge measurements showed raw shifts ranging between 0.00 ft. and +0.08 ft. Measurement Nos. 793, 799, and 800 were discounted between -4% and +2% to smooth shift distribution.
Special Computations.--	Discharge measurements for the periods of ice-affected gage height ('b'-days) were estimated using daily temperature data from the Navajo River at Banded Peak Ranch gaging station. Estimation was performed by looking at the base flow between affected periods and adjusting baseflow by observed trends in discharge-temperature relationship on good record days adjacent to the estimated period. Graphical data was a secondary source for estimation.
Remarks.--	The record is good except for the period of ice-affected days in which the record should be considered poor. The instantaneous peak flow on August 3, 2010 should be considered poor as it exceeds the highest historical measured discharge made in water year 2001 by 357%. August 3, 2010 shall be considered as fair as there were hourly discharges in excess of 150% of the highest measured discharge for the water year. Station maintained and record developed by Brian Leavesley.

Recommendations.--

A crest gage should be installed at the gage to maintain a peak gage height record. Levels should be rerun at the gage in water year 2011 until closure of the survey is made. GPS should be taken to the site to obtain refined LAT/LONG coordinates as there is discrepancy in the seconds of longitude between the station description and AQUAMAP GIS.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA

RATING TABLE--

RIOBLACO06 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

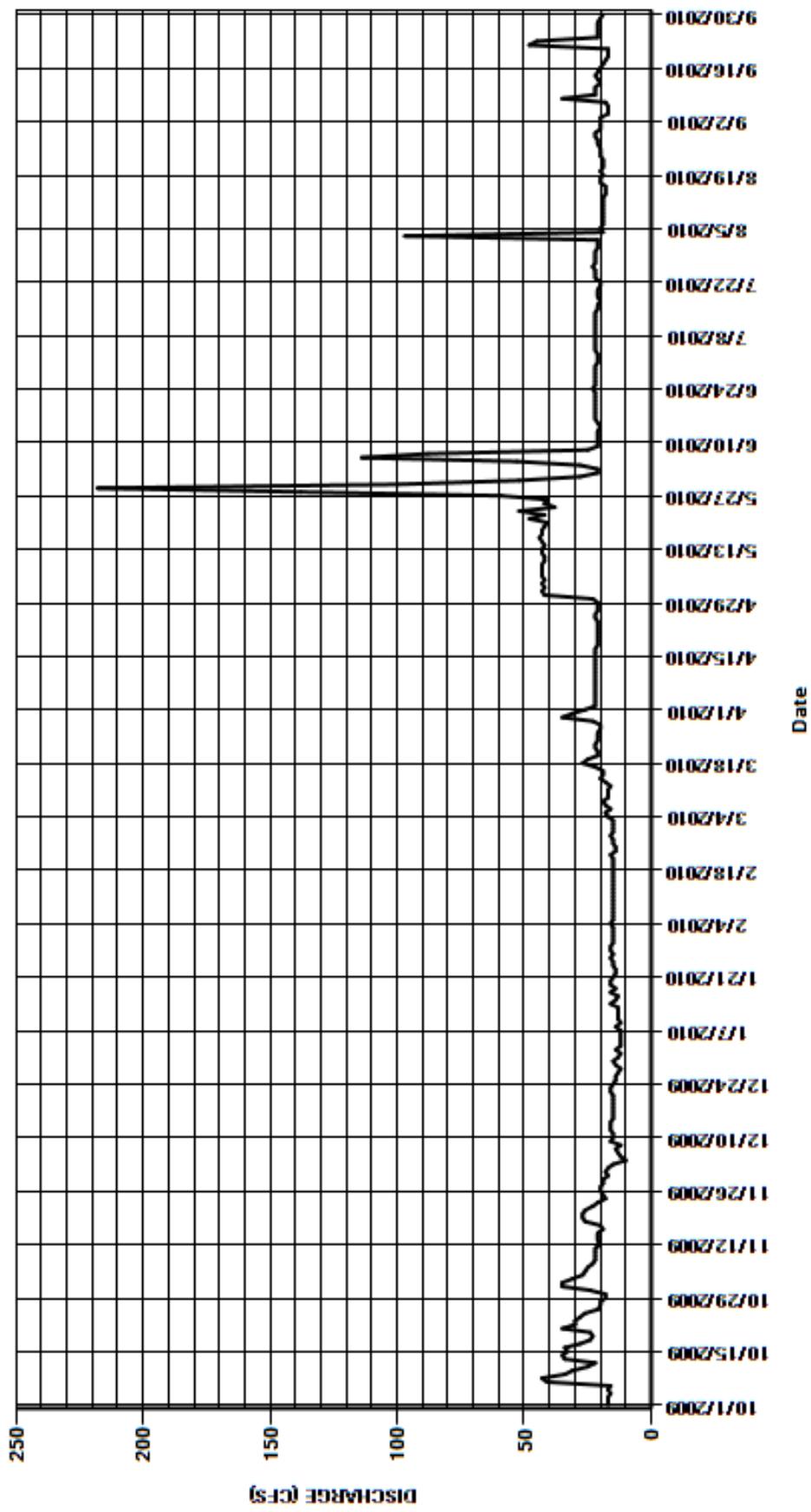
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	35	18	12	e15	15	26	42	28	21	21	20
2	17	35	17	14	e15	15	22	43	21	21	21	20
3	17	31	15	12	e15	15	22	42	21	21	97	20
4	16	27	10	12	16	17	22	43	28	22	19	17
5	17	26	12	12	15	18	22	42	53	22	20	17
6	16	25	13	12	15	16	22	43	114	22	19	17
7	41	23	14	12	15	18	22	43	88	22	19	18
8	43	22	12	14	15	19	22	43	25	22	19	35
9	34	22	16	12	15	17	22	43	21	22	19	22
10	31	22	e15	13	15	17	22	42	21	22	19	22
11	25	22	e15	13	e15	17	22	42	21	22	19	22
12	22	20	16	13	e15	16	22	43	21	22	19	20
13	34	21	e16	13	e15	18	22	43	21	22	19	21
14	35	21	e16	16	e15	20	22	42	20	22	18	22
15	33	21	e15	14	e15	19	22	43	21	21	18	21
16	34	19	e15	13	e15	19	22	44	22	21	18	20
17	28	20	e15	16	e15	22	22	43	22	20	20	19
18	24	26	e15	14	e15	27	21	43	22	21	20	18
19	23	27	e15	16	15	25	21	42	22	21	19	17
20	24	27	e15	16	15	21	21	41	22	21	20	17
21	35	26	e15	15	15	21	21	48	22	20	19	17
22	30	23	16	14	16	22	21	42	22	20	19	48
23	30	21	16	14	14	22	21	52	22	22	19	45
24	28	18	e15	15	14	21	21	38	23	22	20	21
25	26	19	e14	15	15	21	22	42	22	22	20	21
26	21	20	14	16	15	21	22	41	22	23	20	21
27	20	20	13	15	16	20	21	59	22	22	21	21
28	20	19	12	16	15	20	21	138	22	22	21	21
29	18	19	14	e16	---	23	21	218	22	22	22	20
30	18	17	15	e15	---	35	23	100	22	22	22	19
31	24	---	13	e15	---	31	---	52	---	21	20	---
TOTAL	801	694	452	435	421	628	655	1682	855	668	686	659
MEAN	25.8	23.1	14.6	14	15	20.3	21.8	54.3	28.5	21.5	22.1	22
AC-FT	1590	1380	897	863	835	1250	1300	3340	1700	1320	1360	1310
MAX	43	35	18	16	16	35	26	218	114	23	97	48
MIN	16	17	10	12	14	15	21	38	20	20	18	17
CAL YR	2009	TOTAL	9669	MEAN	26.5	MAX	231	MIN	10	AC-FT	19180	
WTR YR	2010	TOTAL	8636	MEAN	23.7	MAX	218	MIN	10	AC-FT	17130	

MAX DISCH: 753 CFS AT 03:00 ON Aug. 03,2010 GH 4.17 FT. SHIFT 0.02 FT.

MAX GH: 4.17 FT. AT 03:00 ON Aug. 03,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
RIO BLANCO AT THE MOUTH NEAR TRUJILLO
Water Year 2010

Location.--	Lat. 37°07'40", Long. 107°02'03", in SW 1/4 SE 1/4 sec. 2, T.33 N., R.2 W., NMPM, Archuleta County.
Drainage and Period of Record.--	170 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 48-inch corrugated well and a 96-inch X 60-inch wooden shelter. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). A Sutron Constant Flow Bubbler (CFB) was installed July 29, 2010 to provide secondary gage height record independent of the stilling well. The low flow control is a cobble riffle 15-ft below the gage. At medium and high flows a boulder weir located 30-ft. below the gage controls. No other changes.
Hydrologic Conditions.--	Large cobbles and boulders line the channel above and below the gage. A large boulder weir was installed below the gage. The United States Bureau of Reclamation diverts a majority of the water upstream of the gage for the San Juan Chama Project. The gage is located approximately one mile above the confluence with the San Juan River.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart and bubbler record for backup purposes. The gage was visited on 17 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 4 separate occasions. The first two adjustments of the year on Oct. 1, 2009 (+1.11') and Oct. 21, 2009 (+1.22') were necessary due to close lightning strikes resetting the shaft encoder to 0.00. All other adjustments made were -0.02 ft and -0.01 feet. Resetting of the shaft encoder from lightning was corrected by distributing the correction back to the point where the reset occurred. The shaft encoder correction on Oct. 21, 2009 was found to be 0.02 ft high, therefore the correction shown in the 15-minute punches was distributed in the PRM and the -0.02 ft datum correction on Oct. 26, 2009 taken back to Oct. 21st correction. Three flush corrections were made this water year. The flush corrections occurred on Aug. 10, 2010 (-0.04 ft), Sep. 17, 2010 (-0.02 ft), and Sep. 28, 2010 (-0.03 ft). The flush corrections at this gage tend to be negative because groundwater infiltrates the stilling well. The flush corrections were related to recent storm events within the stream flow record prior to the flush corrections; the flush corrections were prorated by time through the hydrograph of the storm event and then carried to the flush correction. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov 25-30; Dec. 1-31, 2009; Jan. 1-31; Feb 1, 4-11, 19-22, 25-28; Mar. 1-14, 2010; when it is believed there was ice effect and that the stilling well at the gage became isolated: Feb. 2, 3, 12-18, 23, 24, 2010; and when the stilling well was isolated from river: Oct. 31; Nov. 17, 24, 2009 . The gage becomes isolated at a gage height of 1.04 to 1.05 ft. This happened during the dates identified. With the installation of the CFB at the end of July, gage heights down to 1.06 ft. were shown to have communication between the stilling well and river.
Datum Corrections.--	Levels were not run this water year.
Rating.--	The control is a boulder weir located approximately 30-ft. below the gage. Small gravels fill and scour with the change in stage causing shifts. Rating No. 4, dated Nov. 19, 2008 was continued from the previous water year until Mar. 30, 2010 at 1100. Rating No. 5, dated Mar. 30, 2010 was instituted from 1200 on Mar. 30, 2010 through the end of the water year. Fourteen measurements (Nos. 619-632) were made during the current water year ranging in discharge from 16.0 to 114 cfs. They cover the range in stage experienced except for the lower average daily flows of Dec. 4, 5, 28, 2009; Jan. 1, 3, 4, 8, 9; Jul. 17-19, 21, 22; Sep. 5-7, 19-21, 2010 and the higher average daily flows of Apr. 10-29; May 5-13, 18, 21-24, 28-31; Jun. 6, 7, 2010. The instantaneous peak flow of 778 cfs occurred at 0715, Apr. 17, 2010 at a gage height of 3.86 ft and a shift of 0.00 ft. It exceeded measurement No. 623 made Apr. 14, 2010 by 1.78 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were distributed by time without consideration given to change in stage. Shifting is mainly caused by erosion and deposition of small to medium gravels on the control section. Shifts were distributed equally by time from 0000 Oct. 1, 2009 (0.00 ft) until 1103 Mar. 4, 2010 (0.00 ft). Shift was then prorated by time from 1200 Mar. 4, 2010 (0.00 ft) to 1155 Mar. 30, 2010 (+0.01 ft). Shift was then distributed equally from 1200 Mar. 30, 2010 (0.00 ft) through the end of the water year (0.00 ft). The shift was transitioned from +0.01 ft to 0.00 ft on Mar. 30 in order to match flow values as the rating transitioned was made. Measurements show unadjusted shifts varying from -0.01 to +0.03 feet (meas. No. 625 had shift of -0.07 ft – this was attributed to poor measurement, in very swift water with cat-whisker pygmy meter). Shifts were applied directly and given full weight except for measurement No.'s 619, 623-627, 630, and 632 which were discounted -9% to +4% to smooth shift distribution.
Special Computations.--	Two electrical storms occurred in October that caused the shaft encoder to reset to 0. A datum correction was applied to the bad data and reloaded into the record program. The correction was resolved by applying a datum correction and comparing it with good data before and after the reset occurred. Discharge for periods of ice affected record and gage isolation was estimated on the basis of adjacent good record days, partial good record days, comparison with the discharge at Rio Blanco below the Blanco Diversion Dam (RIOBLACO) gage and air temperature records at the Navajo River at Banded Peak (NAVBNACO) gage. A hydrograph was used.
Remarks.--	Record fair, except for those periods of ice affect and stilling well isolation which are estimated and should be considered poor. Station maintained and record developed by Brian Leavesley.

Recommendations.--

Run levels in WY11.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO BLANCO AT THE MOUTH NEAR TRUJILLO

RATING TABLE--

RIOMOUCO04 USED FROM 01-Oct-2009 TO 30-Mar-2010
RIOMOUCO05 USED FROM 30-Mar-2010 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	32	e22	e15	e17	e17	89	104	96	19	21	19
2	17	34	e21	e17	e17	e17	51	100	75	21	20	18
3	18	32	e19	e15	e18	e17	43	90	67	23	91	18
4	18	28	e14	e15	e18	e18	45	90	61	20	26	16
5	18	27	e15	e17	e18	e19	76	118	69	20	24	15
6	18	25	e16	e16	e18	e17	92	138	130	19	20	15
7	20	24	e17	e16	e18	e20	68	124	180	18	19	15
8	54	23	e20	e15	e18	e21	86	132	86	18	18	34
9	31	22	e19	e15	e18	e19	112	131	60	19	18	30
10	31	21	e17	e16	e18	e18	139	148	51	19	17	20
11	25	21	e17	e17	e17	e19	155	126	44	18	16	18
12	22	21	e19	e18	e17	e18	181	124	40	18	17	18
13	25	21	e20	e17	e17	e22	194	116	35	17	17	17
14	35	24	e18	e18	e17	e24	145	103	33	17	16	18
15	29	23	e18	e17	e17	25	195	99	30	16	16	18
16	33	20	e17	e16	e18	27	209	98	23	16	16	16
17	27	e22	e19	e18	e17	32	547	110	22	15	20	16
18	25	27	e18	e16	e18	42	313	118	21	15	18	16
19	23	30	e17	e17	e18	53	224	110	21	15	17	15
20	23	30	e17	e18	e18	43	193	107	20	16	18	14
21	31	29	e18	e18	e18	46	199	123	20	15	17	15
22	32	28	e19	e18	e18	50	223	145	20	15	17	16
23	28	24	e19	e17	e16	53	166	139	19	17	18	85
24	28	e21	e18	e18	e16	43	123	149	19	18	19	20
25	26	e28	e17	e17	e17	37	117	111	18	18	22	19
26	23	e30	e16	e17	e17	42	120	95	18	19	18	19
27	21	e32	e16	e17	e18	34	133	98	18	19	18	18
28	22	e29	e15	e19	e18	33	143	180	18	22	18	18
29	20	e25	e16	e19	---	44	139	295	19	20	21	18
30	21	e22	e17	e18	---	84	108	222	19	20	22	17
31	e23	---	e16	e18	---	92	---	140	---	23	28	---
TOTAL	785	775	547	525	490	1046	4628	3983	1352	565	663	611
MEAN	25.3	25.8	17.6	16.9	17.5	33.7	154	128	45.1	18.2	21.4	20.4
AC-FT	1560	1540	1080	1040	972	2070	9180	7900	2680	1120	1320	1210
MAX	54	34	22	19	18	92	547	295	180	23	91	85
MIN	17	20	14	15	16	17	43	90	18	15	16	14

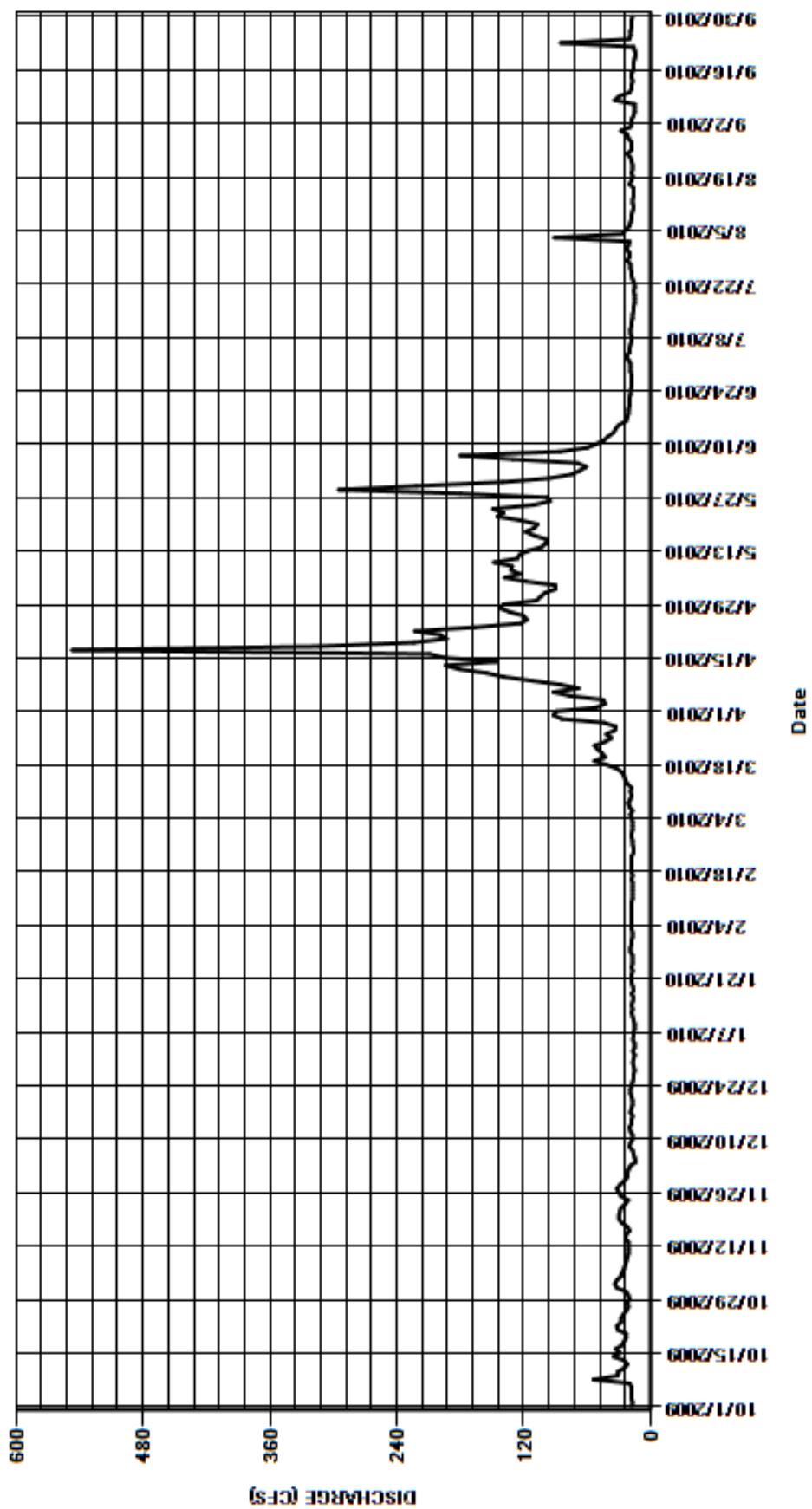
CAL YR	2009	TOTAL	16876	MEAN	46.2	MAX	398	MIN	14	AC-FT	33470
WTR YR	2010	TOTAL	15970	MEAN	43.8	MAX	547	MIN	14	AC-FT	31680

MAX DISCH: 778 CFS AT 07:15 ON Apr. 17,2010 GH 3.86 FT. SHIFT 0 FT.

MAX GH: 3.86 FT. AT 07:15 ON Apr. 17,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO BLANCO AT THE MOUTH NEAR TRUJILLO
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
Water Year 2010

Location.--	Lat. 37°05'07", Long. 106°41'20", in SE 1/4 NW 1/4 sec. 24, T.33 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on right bank at downstream side of private bridge on Banded Peak Ranch, 0.5 mi downstream from Cutthroat Creek, 2.8 mi downstream from East Fork of the Navajo River, and 11.2 mi northeast of Chromo, Co.
Drainage and Period of Record.--	69.8 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP in a 48-inch x 48-inch redwood shelter and well. The shaft encoder and graphic recorder are on separate floats. The floats are located inside a 14-inch PVC oil cylinder. The primary reference gage is an electric drop tape in the gage. A drop tape is a supplemental reference gage and is mainly used when the well is frozen. An air temperature sensor and Sutron AccuBubbler are used for supplemental purposes. No other changes.
Hydrologic Conditions.--	The stream is composed of sand, gravel, and large cobble. In the spring, sustained high water scours sand and gravel from the streambed. In mid-Summer to late Fall and Winter, the sand and gravel are deposited in the channel at the gage. The control and channel are highly susceptible to fill and scour events.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with bubbler gage data and chart record for backup purposes. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. Record is complete. It is reliable except for the following periods: stage-discharge relationship affected by ice on Dec. 3-5, 8-11, 15-21, 25-28, 2009; Jan. 1, 3-13, 15, 16, 18, 25-27, 31; Feb. 2, 3, 12-15, 17, 18, 23, 24, 26, 27; Mar. 6, 12, 13, 20, 21, 2010 ; gage heights affected by velocity drawdown in stilling well: May 28-31; Jun. 3-6, 2010 ; stilling well intakes unable to be flushed out (plugged): Jun. 15 – Jul. 19, 2010. During spring runoff, there is considerable sediment load that fills the intakes to the stilling well. At channel velocities above ~4.5 feet per second, after the intakes to the river are flushed out, there appears to be drawdown in the stilling well caused by the velocity past the intakes. These drawdown days are graphically estimated and are considered 'poor' gage height record. As the intakes to the well fill with sediment, it appears to buffer out the velocity effect and provide a smoother gage height record. It is possible that this buffering would leave true daily peak and low values out, however the daily average for these plugged intake days should be at least 'fair' gage height record. Over the water year, 3 flush corrections were applied to the GH record. They occurred as a result of flushing the intakes on: 4/14, 5/3, and 7/19/2010. The flush correction on 4/14 had to be distributed manually as there was a concurrent shaft encoder correction within the record. Bubbler gage height record was substituted in to the shaft encoder gage height record for the period of Dec. 29, 2009 – Jan. 30, 2010 due to the cold weather causing an ice disk to form under the oil in the float well and providing inaccurate gage height readings during periods of seemingly good gage height record (good – flat gage height w/o ice spikes). Bubbler data was also substituted in for shaft encoder data for a precipitation event period of Aug. 3 – 10, 2010 as the bubbler showed to track the event better and not be affected by flush correction after event. These bubbler data periods are considered 'good' gage height record.
Datum Corrections.--	Levels were not run in WY2010. Levels were last run on July 23, 2009 using BM#6 as the base. No corrections were made as the ET index was found to be within allowable error tolerances.
Rating.--	The control consists of a cobble riffle whose location varies during the year from 30 to 70 feet below the gage. Shifting occurs throughout the range-in-stage. Rating No. 23, dated Aug. 22, 1996, was continued in use this year. It is fairly well defined between 22 and 603 cfs. Seventeen measurements (Nos. 836 – 852) were made during the current water year ranging in discharge from 27.1 to 372 cfs. They cover the range in stage except for the higher daily flows of May 23, 24, 27 -31; Jun. 1-11, 2010, when the average daily discharge was above 372 cfs, and the lower range in stage when the average daily flows were less than 27.1 cfs; Dec. 6, 9-12, 14-28, 2009; Jan 1, 3, 4, 7-9, 22, 27-30; Feb. 17-28; Mar. 1-6, 11, 12, 2010. The peak discharge of 958 cfs occurred at 0030 on June 7, 2010 at a gage height of 4.06 feet with a shift of -0.25 feet. It exceeded measurement No. 845 (6/3/2010) by 0.68 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition on the control section below the gage. Shifts were distributed by time without consideration given to change in stage. Measurements showed unadjusted shifts from -0.25 to +0.15 ft. All were given full weight and applied directly except for measurement Nos. 837, 846, 847, 850, 851 which were discounted between -4 and +5 % in order to smooth the shift distribution. Shift for WY2010 matched that at the end of WY09, +0.12 ft.; carried to measurement on 10/26/2009. Measurement on 12/2/2009 gave +0.14 ft shift. Shift distributed by time from 10/26 to 12/2. Shift distributed by time +0.14 ft on 12/2/2009 to +0.13 ft. at measurement on 2/5/2010. Some early increases in flow removed sediment from the channel and shift started to move in a negative direction. Shifts distributed by time +0.13 ft. shift on 2/5 to +0.10 ft. shift on 3/24. Shift distributed by time +0.10 ft. to +0.09 ft. on 4/5/2010 at the beginning of the spring runoff where the flows begin to drastically increase. The increase in flow began to scour and shifts distributed by time from +0.09 on 4/5 to -0.05 on 4/14 (measurement no. 842). From 4/14 to 5/3, scour continued, shifts distributed by time from -0.05 ft. to -0.07 ft. Increase in runoff slowed through mid-May; -0.07 ft. shift carried through to 5/18. Here runoff really increased and caused further scour; from 5/18 through 6/3, shift distributed by time -0.07 ft. to -0.25 ft. The -0.25 ft. shift was carried to the peak of the annual hydrograph on 6/7/2010 @ 0030. After seasonal peak, measurements showed an increase in shift from sediment being deposited in the channel. Shift distributed by time from peak on 6/7 (-0.25 ft. shift) to measurement on 6/15 (-0.23 ft. shift). The -0.23 ft. shift held through 6/30. Distributed by time from measurement on 6/30 (-0.23 ft. shift) to measurement on 7/19 (-0.22 ft. shift). The -0.22 ft. shift carried to beginning of storm event on 8/3. Distributed by time through rain event 8/2 (-0.22 ft. shift) to 8/5 (-0.20 ft. shift). The -0.20 ft. shift carried through to the end of water year.

Special Computations.-- Discharge for periods of ice effect was estimated on the basis of good record before and after ice affect, partial day of good records and the temperature record from the air temperature sensor at the gaging station. The bubbler equipment was used as a secondary reference and was deemed to be reliable for certain periods of record when velocity in the channel affected the gage height in the stilling well. There was a concurrent shaft encoder and flush correction that took place during the water year between 2/5 and 4/14. A +0.01 ft. SE correction was distributed by time from 2/5 to 4/14, and a +0.01 flush correction distributed by time starting on 4/13 through 4/14. The calculation was made using the DWR unit time prorated shift program and the two adjustments added together.

Remarks.-- Record is good, except for periods of ice effect and when the stilling well elevation was affected by drawdown, which are estimated and should be considered poor. June 15 and 30 when an attempt to flush the intakes was made but was not successful, should be considered poor. The instantaneous peak flow should be considered as poor as it exceeded the highest measured discharge by more than 150%. Station maintained and record developed by Brian Leavesley.

Recommendations.-- The shelter should be restained to prevent deterioration. It would be nice to have a constant flow bubbler system as it may track river stage better during high water season as the current bubbler does not track very well at all at high river stage. This secondary reference during high water would be nice to determine the drawdown effect on the stilling well at higher channel velocities.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO

RATING TABLE--

NAVBANCO23 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	39	30	e27	28	25	57	183	460	96	46	56
2	31	38	30	28	e28	25	46	163	421	88	45	49
3	31	37	e30	e27	e28	25	41	143	e384	99	92	45
4	31	36	e29	e27	28	26	43	159	e435	91	79	39
5	32	35	e28	e28	28	26	50	213	e529	84	74	37
6	30	33	27	e28	28	e27	49	262	e726	79	58	35
7	41	31	28	e27	28	28	42	261	781	73	52	33
8	44	31	e28	e26	28	29	50	288	705	68	52	77
9	39	31	e27	e27	28	28	77	311	604	71	48	64
10	38	31	e26	e28	28	28	104	331	493	68	45	47
11	36	30	e26	e28	28	27	127	273	395	64	43	43
12	35	32	26	e28	e28	e27	163	270	321	59	44	40
13	43	36	28	e28	e28	e28	192	253	257	56	44	38
14	40	37	27	28	e28	28	162	239	220	51	40	37
15	38	34	e27	e28	e28	28	232	243	e192	50	38	35
16	38	32	e27	e28	28	29	278	262	204	48	40	34
17	36	30	e27	28	e27	32	335	306	196	48	50	33
18	35	29	e27	e28	e27	36	279	324	186	51	40	33
19	35	30	e26	29	27	39	269	250	174	46	40	32
20	36	29	e26	29	27	e36	261	251	164	45	41	33
21	39	29	e26	28	27	e34	307	290	151	47	37	33
22	37	30	26	26	27	37	347	351	138	52	35	59
23	36	32	26	28	e26	40	274	423	127	56	40	75
24	35	31	26	28	e26	37	220	403	123	49	50	48
25	36	32	e26	e28	26	35	208	310	121	48	54	42
26	33	31	e26	e28	e26	36	227	308	120	44	44	38
27	33	30	e26	e27	e26	34	260	376	115	41	40	36
28	33	31	e27	27	26	34	290	e521	107	40	48	35
29	29	32	28	27	---	38	285	e506	99	41	51	34
30	30	30	28	27	---	50	228	e469	e94	48	111	34
31	34	---	28	e28	---	62	---	e429	---	56	76	---
TOTAL	1095	969	843	857	766	1014	5503	9371	9042	1857	1597	1274
MEAN	35.3	32.3	27.2	27.6	27.4	32.7	183	302	301	59.9	51.5	42.5
AC-FT	2170	1920	1670	1700	1520	2010	10920	18590	17930	3680	3170	2530
MAX	44	39	30	29	28	62	347	521	781	99	111	77
MIN	29	29	26	26	26	25	41	143	94	40	35	32

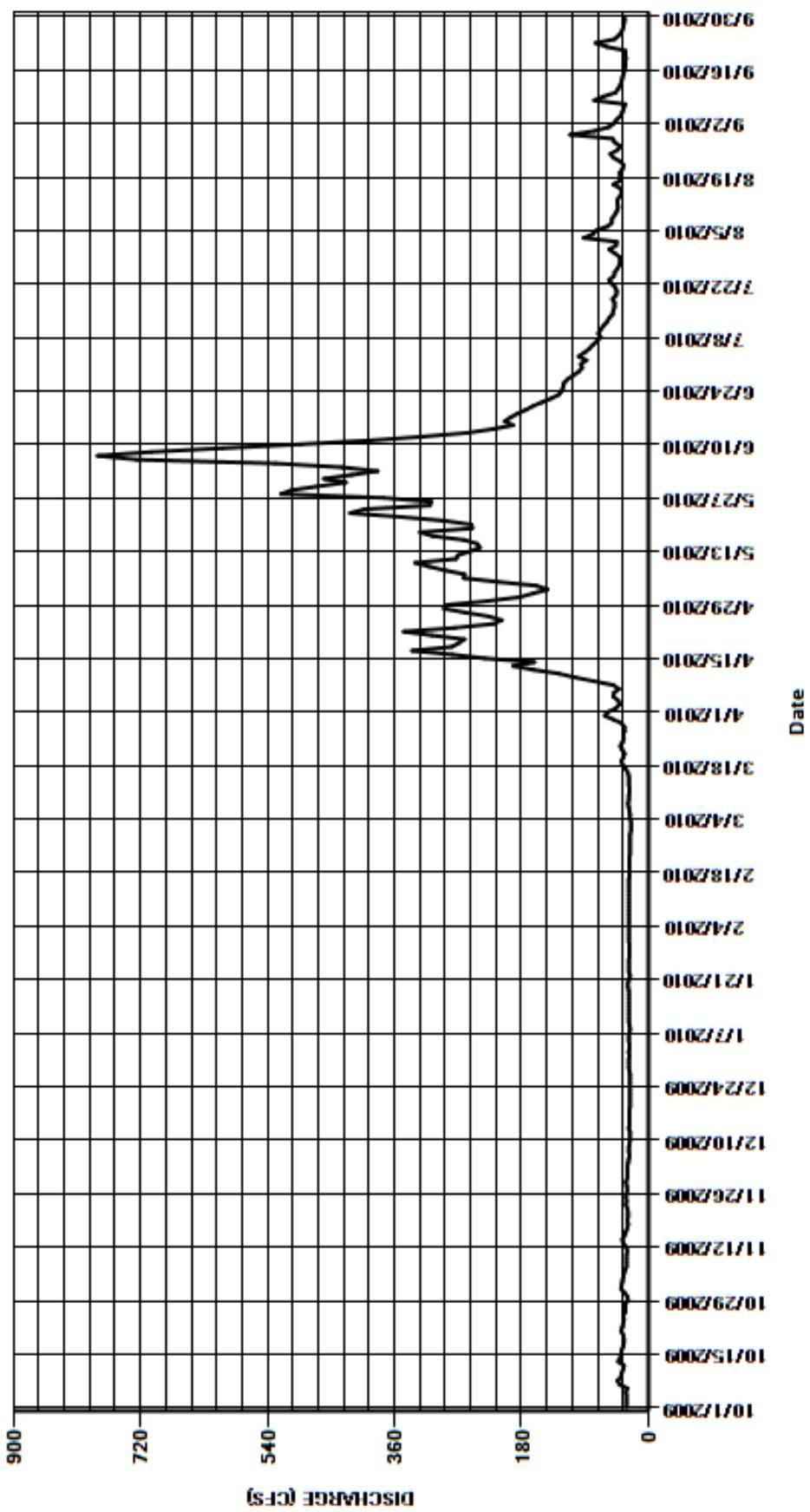
CAL YR	2009	TOTAL	41776	MEAN	114	MAX	809	MIN	26	AC-FT	82860
WTR YR	2010	TOTAL	34188	MEAN	93.7	MAX	781	MIN	25	AC-FT	67810

MAX DISCH: 958 CFS AT 00:30 ON Jun. 07,2010 GH 4.06 FT. SHIFT -0.25 FT.

MAX GH: 4.06 FT. AT 00:30 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
OSO DIVERSION NEAR CHROMO, CO.

Water Year 2010

Location.-- Lat. 37°01'49", Long. 106°44'14", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, T.32 N., R.2 E., NMPPM, Archuleta County.

Drainage and Period of Record.-- N/A

Equipment.-- Sutron Satlink 2 DCP and a digital shaft encoder in a concrete control house used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send data to their SCADA system. The primary reference gage is an electric drop tape inside the well. Control is a 15-foot concrete Parshall flume set into the diversion tunnel below ground. In May a Sutron Stage Discharge Recorder (SDR) replaced the shaft encoder. No other changes this water year.

Hydrologic Conditions.-- The Oso diversion is part of the San Juan-Chama Project and is a transmountain diversion structure which creates an on-stream reservoir on the Navajo River below the diversion to collect runoff and settle out sediment. Water can be released downstream by means of a vertical tainter gate or taken into the Azotea tunnel which conveys water to the Rio Grande basin. Diversion amount is controlled by the capacity of the tunnel as water in the tunnel is also diverted from the Little Navajo River and Rio Blanco. The measurement flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release limits set forth in the legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control. Occasionally, the tainter gates on the diversion tunnel will become stuck open from ice and diversion into the tunnel will take place.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with satellite data used for backup purposes. The record is complete and reliable. Upon inspection on March 4, the shaft encoder was reading - 0.22 ft. It is thought that the tape had been knocked off the encoder wheel in late February and the SE did not reset to the original elev. At the March inspection it was reset to match the paper chart. When the diversion began in March, the SE was 0.23 feet high from the primary gage height. It was reset within 2 hours of the beginning of diversion. A correction to the datum in the record reflects this difference and corrects for the discrepancy at the start of diversion on March 22. A - 0.01 ft shaft encoder correction was made on May 18.

Datum Corrections.-- Levels have not been run at this site before.

Rating.-- The control is a standard 15-ft. concrete Parshall flume. Rating No. 1 (OSODIVCO01) is a standard 15-ft. Parshall flume rating above a gage height of 0.05 ft, was used the entire water year. The flows below a gage height of 0.05 ft. are assumed to be 0. This is caused by the intake to the stilling well is 0.05 ft. above the floor of the flume or the stilling well does not provide sufficient depth. No measurements were made this water year because the flume is located underground. The peak flow of 578 cfs occurred at 0845 on 6/7/2010 at a gage height of 4.22 ft. with a shift of 0.00 ft.

Discharge.-- No measurement of this diversion has taken place. A 0.00 shift was applied for the entire year. The discharge record was computed by direct application of the rating to the gage height record.

Special Computations.-- No special computations were necessary.

Remarks.-- Record is rated as 'fair' for the entire period. A 'fair' rating was given due to the fact that levels have never been run at this site to determine the actual elevation of the flume; also that measurements have never taken place due to the inaccessibility of the flume. Station maintained and record developed by Brian Leavesley.

Recommendations.-- Levels should be run at this site.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OSO DIVERSION NEAR CHROMO, CO.

RATING TABLE--

OSODIVCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	37	121	440	39	0	8.3
2	0	0	0	0	0	0	20	106	404	37	0	0
3	0	0	0	0	0	0	13	82	382	50	8.8	0
4	0	0	0	0	0	0	15	106	444	33	8.1	0
5	0	0	0	0	0	0	25	183	501	27	7.5	0
6	0	0	0	0	0	0	37	240	525	19	0.38	0
7	0	0	0	0	0	0	31	228	538	15	0	0
8	0	0	0	0	0	0	34	246	515	14	0	3
9	0	0	0	0	0	0	66	265	500	20	0	0
10	0	0	0	0	0	0	107	297	440	14	0	0
11	0	0	0	0	0	0	138	222	354	10	0	0
12	0	0	0	0	0	0	187	213	291	7.4	0	0
13	0	0	0	0	0	0	214	185	220	0	0	0
14	0	0	0	0	0	0	181	154	168	0	0	0
15	0	0	0	0	0	0	239	154	136	0	0	0
16	0	0	0	0	0	0	285	182	145	0	0	0
17	0	0	0	0	0	0	440	250	140	0	0	0
18	0	0	0	0	0	0	311	270	128	0	0	0
19	0	0	0	0	0	0	277	205	114	0	0	0
20	0	0	0	0	0	0	262	215	105	0	0	0
21	0	0	0	0	0	0	299	306	91	0	0	0
22	0	0	0	0	0	7.2	353	371	82	0	0	0.18
23	0	0	0	0	0	11	266	395	74	0	0	5.3
24	0	0	0	0	0	10	200	389	68	0	0	0
25	0	0	0	0	0	7.2	194	286	68	0	0	0
26	0	0	0	0	0	5.9	217	296	67	0	0	0
27	0	0	0	0	0	6.5	254	369	60	0	0	0
28	0	0	0	0	0	3.8	280	463	51	0	0	0
29	0	0	0	0	---	6.3	286	494	36	0	0	0
30	0	0	0	0	---	12	205	492	31	0	0.2	0
31	0	---	0	0	---	43	---	432	---	0	0.25	---
TOTAL	0.00	0.00	0.00	0.00	0.00	112.90	5473	8217	7118	285.40	25.23	16.78
MEAN	0	0	0	0	0	3.64	182	265	237	9.21	0.81	0.56
AC-FT	0	0	0	0	0	224	10860	16300	14120	566	50	33
MAX	0	0	0	0	0	43	440	494	538	50	8.8	8.3
MIN	0	0	0	0	0	0	13	82	31	0	0	0

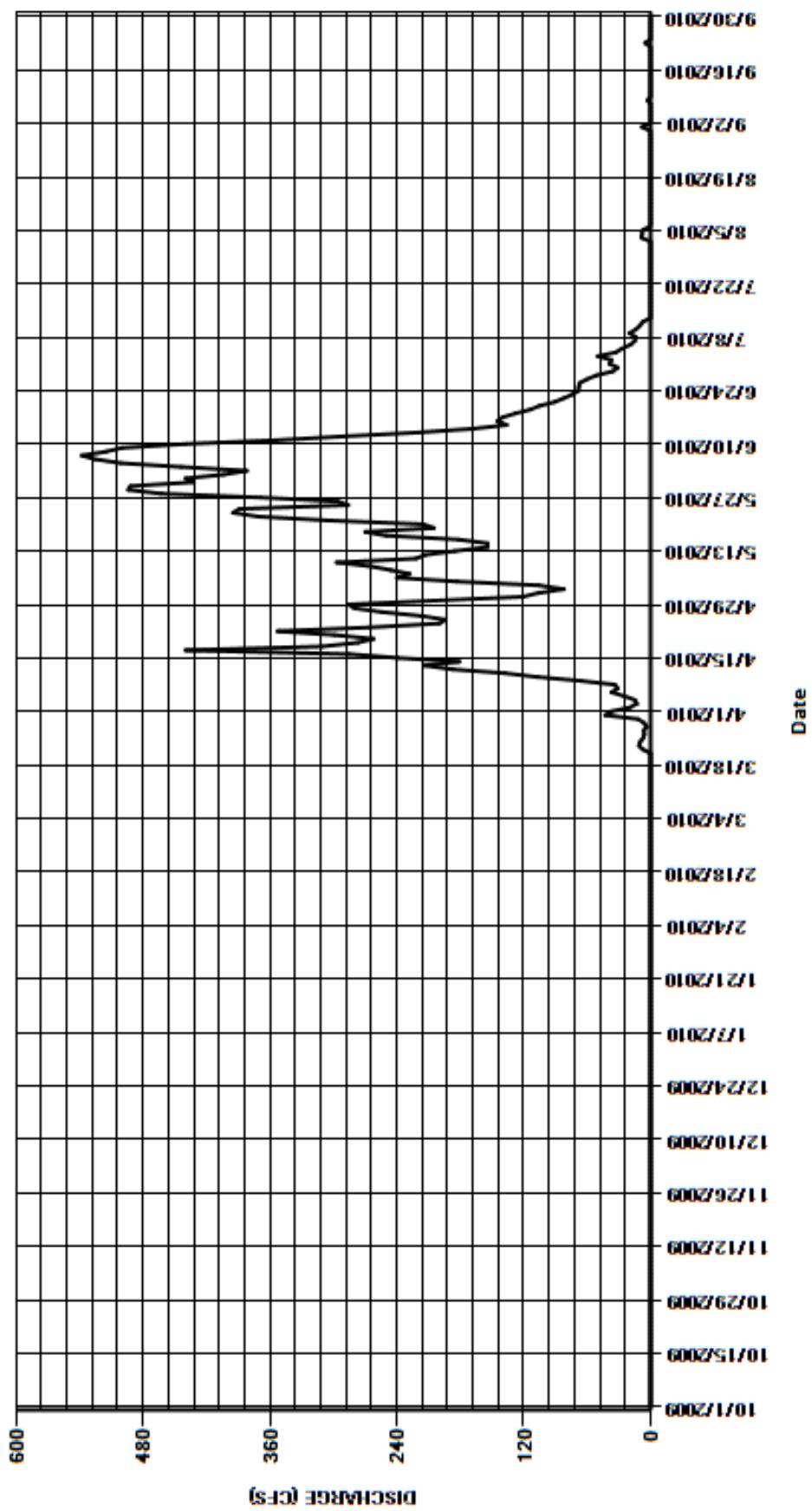
CAL YR	2009	TOTAL	24746.95	MEAN	67.8	MAX	491	MIN	0	AC-FT	49090
WTR YR	2010	TOTAL	21248.31	MEAN	58.2	MAX	538	MIN	0	AC-FT	42150

MAX DISCH: 578 CFS AT 08:45 ON Jun. 07,2010 GH 4.22 FT. SHIFT 0 FT.

MAX GH: 4.22 FT. AT 08:45 ON Jun. 07,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OSO DIVERSION NEAR CHROMO.CO.
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
Water Year 2010

Location.-- Lat. 37°01'49", Long. 106°44'14", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, T.32 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 600 ft downstream from Oso Diversion Dam, 5.8 mi east of Chromo, and 6.1 mi upstream from Little Navajo River.

Drainage and Period of Record.-- 100.5 mi². March 1971 to current year.

Equipment.-- Graphic water stage-recorder and Sutron Satlink 2 DCP satellite monitoring connected to a shaft encoder until May when the shaft encoder was replaced by a Sutron SDR unit. Recorders are on separate floats in a concrete shelter and well. The primary reference gage is an electric drop tape in the gage. Upon station visit on March 24, 2010, it was discovered that the electric tape had been replaced with a different one by the Bureau of Reclamation. No outside staff gage. Control is an 8-foot Parshall flume set in a 60-foot wide concrete structure that acts as a weir at higher flows. No other changes this water year.

Hydrologic Conditions.-- Cobble and gravel are deposited in the stilling pool above the control throughout the water year. At least once per year the USBR removes sediment deposited above the control section. Approximately 250 feet above the control is a USBR diversion dam (Oso Diversion structure) for the San Juan/Chama Project. The San Juan/Chama Project is a trans-basin diversion that diverts water through a pipeline and is delivered to the Rio Grande River basin in New Mexico.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the satellite with chart record and DCP data used for backup purposes. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. A +0.01 ft shaft encoder adjustment was made on 9/13/2010. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the shaft encoder/SDR. The well was flushed once this water year on May 5, 2010, a +0.01 ft flush correction was applied to the measurement gage height, however was not applied to the record as there was a lot of shift change in the channel during the period. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Dec. 6-31, 2009; Jan. 1-29; Feb. 3, 12-16, 2010. During the flush of the stilling well on 5/5/2010, the gage height was artificially increased by pumping into the flush tube. During this period the release gates at the diversion structure upstream were disabled by bureau personnel to prevent release changes. The gage height readings in the record during this flush event were replaced by the gage height value before flush began. When the shaft encoder in the gage house was replaced by a SDR unit in May: a known issue by DWR regarding SDR units being logged by Satlink2 units is that the SDR is performing a daily average computation at its last logging event of the day (if it is setup for no averaging of the current gage height) that causes no data to be sent to the Satlink2 when it is requesting the gage height at that time. The first SDR unit installed there however did not display this shortcoming, however the SDR unit stopped working in September, and a new SDR was installed in its place. The new SDR unit did have this issue with it, and the 2300 hourly average for 9/17/2010 through 9/30/2010 was affected. The hourly average for 2300 (2300-2330) was inserted for the gage heights these days to obtain a correct gage height.

Datum Corrections.-- Levels were not run in WY2010. Levels were previously run 7/23/2009, with no corrections. Levels were run again on October 14, 2010 (WY2011). No corrections were made since the ET index was within the allowable error tolerances. Levels were also run to the two other reference marks (RM#3 and RM#4). RM#3 was found to be reading -0.001 feet low. RM#4 was found to be reading -0.001 feet low. The electric tape reference length was also checked during the 10/14/2010 survey to see if it changed when the bureau switched out electric tape gages (sometime in March). The tape length appeared to remain the same through the change. No corrections were made to gage heights of measurements or charts.

Rating.-- The control is an 8-foot Parshall flume installed in September 1979 to replace a V-notch weir. At an elevation of 3.00 ft, horizontal concrete wing walls extend in both directions for a total of 60 feet. Rating No. 4 was developed and put into use on October 1, 2003. It is fairly well defined between 22 cfs and 285 cfs. It was used all year. Eighteen measurements (Nos. 802 – 819) were made during the current water year ranging in discharge from 32.4 cfs to 95.7 cfs. They cover the range in discharge experienced except for the lower average daily flows of Oct. 1-3, 29, Dec. 3-5, 9-12, 14-22, 24-31, 2009; Jan. 1-13, 15-21, 23-28, Feb. 2-3, 12-20, 25-28, Mar. 1-2, 2010, and the higher average daily flows of May 28-30, Jun. 5-8, Aug. 30, 2010. The peak instantaneous flow of 588 cfs occurred at 2330 on June 6, 2010 at a gage height of 3.94 feet with a shift of +0.04 feet. It exceeded measurement No. 809, made May 3, 2010, by 2.02 feet in stage.

Discharge.--

Shifting control method was used all year. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls. Shifts were applied as defined by measurements, flume cleaning, and flow events; they were distributed by time. Shifts were distributed by time from 0000 Oct. 1, 2009 until the measurement at 1339 Dec. 2, 2009 (+0.04 ft to +0.05 ft). The +0.05 ft shift was carried through to when the USBR was assumed to have cleaned the channel above the flume on Mar. 22, 2010 @ 1000. This cleaning removed sediment and reduced the approach velocity to the flume. From 3/22 through April, sediment was deposited continuously, causing the shift to increase from 0.00 ft to +0.03 ft; this shift was applied at flow events where the flow increased suddenly during the month. Shift increased (0.00 ft to +0.01 ft) at 0800 on Mar. 31, 2010, and again (+0.01 ft to +0.03 ft) at 2200 on Apr. 9, 2010. The +0.03 ft shift was carried through until Apr. 30, 2010 at 2030 when the USBR increased flow to their May release requirement. It was observed that the channel approach to the flume had significantly filled with sediment during the last weeks of April and when the flow was increased, a significant increase in shift occurred. The shift determined from measurement on May 3, 2010 was +0.13 ft and on May 5, 2010 was +0.07 ft. The shift was distributed by time through the rise from 2100 on Apr. 30, 2010 (+0.03') to 0145 on May 1, 2010 (+0.13 ft). The shift was held at +0.13 ft to measurement no. 809 with a shift of +0.13 ft. Shifts were distributed by time from +0.13 ft at 1500 on May 3, 2010 to +0.07 ft at 1053 on May 5, 2010. The drop in shift is attributed to sediment being scoured and moving through the flume due to the increase in flow. Shift was distributed by time to the next measurement (+0.07 ft to +0.06 ft) on May 18, 2010 @ 1439. +0.06 ft shift was carried until May 27, 2010 when the reservoir above the upstream diversion filled from Spring runoff and began to spill, causing a high diurnal flow pattern which scoured more sediment from the channel above the flume. Shift was prorated by time through the spill period from May 27, 2010 @ 2300 to May 30, 2010 @ 0000 (+0.06 ft to +0.04 ft). After this time, additional spill and storm events moved through the flume, however the measured shift through the end of the year stayed at or within ± 0.01 ft of a +0.04 ft. shift; therefore applied shift through the end of the water year was +0.04 ft. Measurements in water year 2011 show a +0.05 ft shift, however, there is a storm event in October 2010 that this shift will be attributed to. Measurements show unadjusted shifts varying from 0.00 to +0.13 ft. Shifts from measurements were applied directly and given full weight except for measurement Nos. 803, 813, 814, & 817 which were discounted between -4% and +1% to smooth shift distribution. No measurements were made during ice effect.

- Special Computations.-- Discharge during ice-affected periods was estimated by considering baseflow discharge on either side of affected record period and smoothing the record between. Temperature data from Navajo River at Banded Peak Ranch (NAVBANCO), located 6 miles upstream was the primary means of estimating discharge variation around the baseflow during ice-affected days.
- Remarks.-- Record good, except for those periods of ice affect and when water stage in the channel approaches the top of the flume or spills over the weir which should be considered poor. Station maintained and record developed by Brian Leavesley.
- Recommendations.-- Setting on SDR unit should be changed to average GH over a short time (3-seconds) for stage computation to allow for communication of the final 15-minute reading of the day to the Satlink2. Levels should be run again in WY2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO

RATING TABLE--

NAVOSOCO04 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

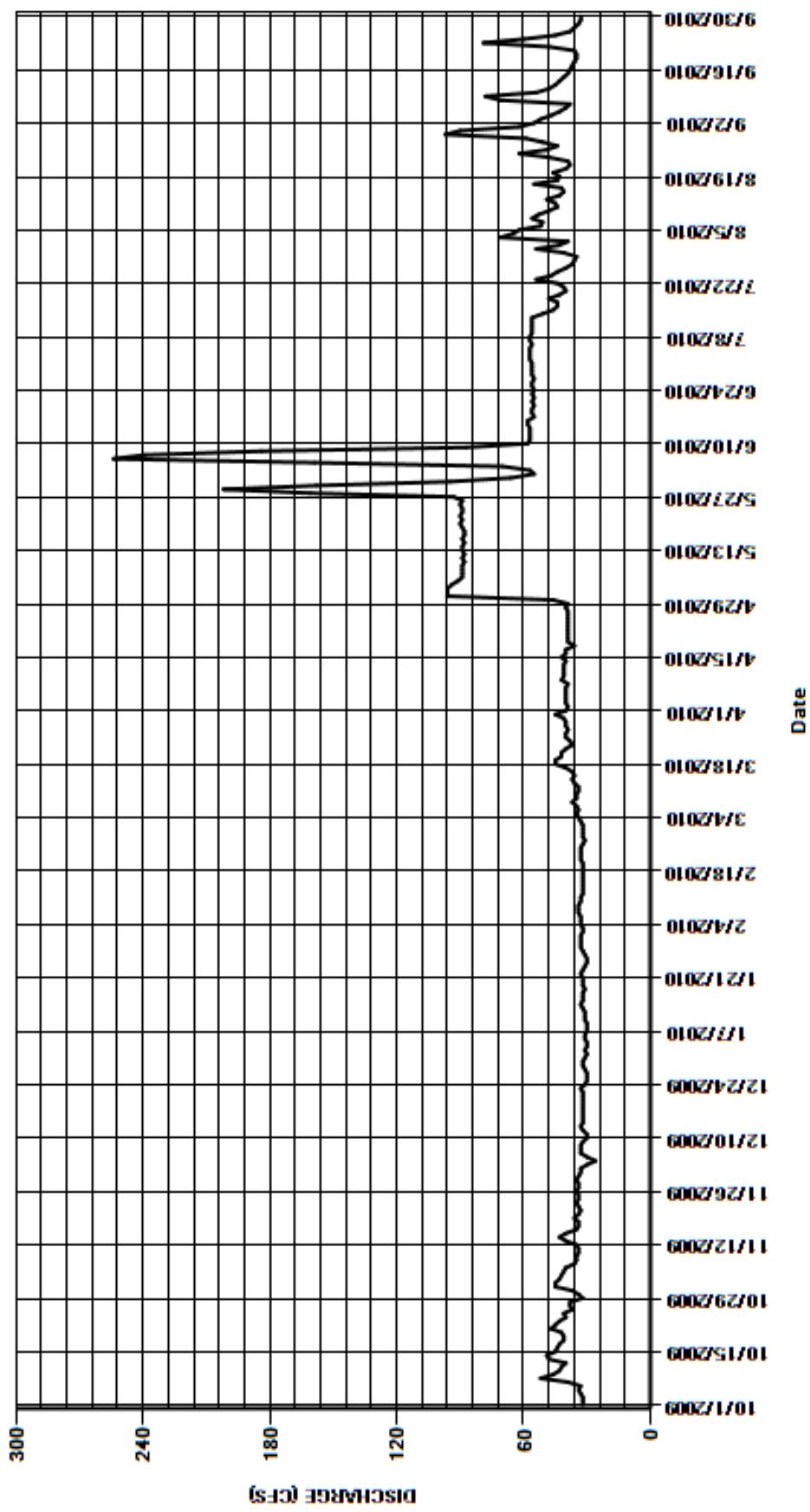
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	45	33	e30	33	32	40	96	66	56	43	62
2	32	45	33	e31	32	32	39	96	55	57	39	55
3	32	43	30	e30	e32	33	40	96	57	57	71	52
4	33	42	26	e30	33	34	40	94	70	57	65	47
5	34	41	30	e31	33	35	40	91	159	57	62	43
6	33	40	e33	e31	33	34	40	89	254	56	52	40
7	39	36	e33	e30	34	35	40	89	239	57	51	38
8	52	35	e33	e30	34	37	39	89	184	57	56	71
9	46	35	e32	e30	34	35	42	89	87	56	53	78
10	43	34	e30	e31	33	35	41	88	58	56	48	54
11	42	34	e30	e31	33	34	41	89	57	56	44	48
12	40	35	e32	e31	e32	34	41	88	57	56	45	45
13	48	40	e33	e32	e32	36	41	89	57	56	49	43
14	49	43	e32	e33	e32	37	40	89	57	51	43	41
15	45	40	e32	e32	e32	36	42	88	58	46	41	39
16	44	35	e32	e32	e32	37	40	89	58	44	42	38
17	43	34	e32	e32	32	40	40	88	55	44	55	37
18	41	34	e32	e31	32	45	36	88	56	48	44	36
19	41	36	e32	e32	32	45	39	89	56	43	43	35
20	42	34	e32	e32	32	42	39	90	55	40	46	35
21	47	33	e32	e32	33	42	39	89	56	41	40	36
22	45	34	e32	e33	33	40	39	90	55	44	38	48
23	43	35	e33	e32	33	37	39	89	56	54	39	79
24	40	34	e31	e31	33	38	39	89	55	47	48	60
25	41	34	e30	e30	32	40	39	90	56	44	62	45
26	37	35	e30	e30	31	40	39	89	56	40	49	38
27	38	34	e30	e31	32	39	39	93	55	37	44	36
28	38	34	e31	e32	32	40	40	161	56	36	51	34
29	32	35	e32	e33	---	40	39	202	56	35	59	33
30	34	34	e32	33	---	41	46	158	56	41	97	33
31	37	---	e31	33	---	45	---	95	---	54	90	---
TOTAL	1243	1103	976	972	911	1170	1198	3049	2352	1523	1609	1379
MEAN	40.1	36.8	31.5	31.4	32.5	37.7	39.9	98.4	78.4	49.1	51.9	46
AC-FT	2470	2190	1940	1930	1810	2320	2380	6050	4670	3020	3190	2740
MAX	52	45	33	33	34	45	46	202	254	57	97	79
MIN	32	33	26	30	31	32	36	88	55	35	38	33
CAL YR	2009	TOTAL	17991	MEAN	49.3	MAX	285	MIN	23	AC-FT	35690	
WTR YR	2010	TOTAL	17485	MEAN	47.9	MAX	254	MIN	26	AC-FT	34680	

MAX DISCH: 588 CFS AT 23:30 ON Jun. 06,2010 GH 3.94 FT. SHIFT 0.04 FT.

MAX GH: 3.94 FT. AT 23:30 ON Jun. 06,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

0934400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE OSO DIVERSION NEAR CHROMO
Water Year 2010

Location.--	Lat. 37°04'32", Long. 106°48'38", in SW¼SE¼ sec. 23, T.33 N., R.1 E., NMPM, Archuleta County.
Drainage and Period of Record.--	N/A. March 1971 to current year.
Equipment.--	Sutron Satlink 2 DCP and a digital shaft encoder in a concrete control house used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Little Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send stage data to their SCADA system. Shaft encoder is set to an inside electric tape. The primary reference gage is an electric drop tape inside the well. Control is a 6-foot concrete Parshall flume set into the diversion tunnel below ground. During the water year an attempt was made to install a Sutron Shaft StageData Discharge Recorder (SDR) in place of the shaft encoder. The SDR was not able to function on the power supplied by the Bureau's equipment. It was found that there is an issue with the wiring causing a power deficiency. The shaft encoder was used, however it seems that at on site visits, if the shaft encoder display is left on, there is not enough power to transmit a signal to the Satlink (Assumed from missing 15-minute transmissions during site visits throughout the year). No other changes this water year.
Hydrologic Conditions.--	The Little Oso Diversion is part of the San Juan-Chama Project and is a transmountain diversion structure which creates an on-stream reservoir on the Little Navajo River above below the diversion to collect runoff and settle out sediment. Water can be released downstream by means of either a vertical tainter slide gate or an adjustable cipoletti weir or t heslide gate. The water above the dam can be taken into the Azotea Tunnel which conveys water to the Rio Grande basin. Diversion amounts are controlled limited by the minimum downstream flow requirements of the Little Navajo River and the capacity of the tunnel. The Rio Blanco diversion is located above the Little Oso and the Oso diversion on the Navajo River is below as water in the tunnel is also diverted from the Rio Blanco. The measurement flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release limits set forth in the legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record and satellite data used for backup purposes. The Bureau adjusted tape length twice during the water year because they were not happy with a condition of zero flow in the flume while the shaft encoder and chart recorder continued to read a gage height around 0.15 ft. The tape was adjusted without recording changes made to the tape length. The change in tape length most certainly adversely affected the gage-height record since the State of Colorado has never shot levels on the reference point. First movement of the weight on the electric tape gage was made on 12/29/2009. It was estimated that the weight was moved 0.15 ft higher based on the fact that the intention of the Bureau was to force the tape to read zero when the diversion gate was shut. The shaft encoder and chart were reading +0.15 ft prior to adjustment. The shaft encoder was not changed. Second movement of the weight on the tape gage was made on 4/12/2010. The Bureau conducted a survey and said the electric tape was adjusted relative to the survey. No further information was provided. The shaft encoder was not adjusted. The weight was estimated to have been moved 0.08 ft lower based on a -0.07 ft shaft encoder correction made on 4/14/2010 to make the shaft encoder match the electric tape reading. Assuming that the shaft encoder was never adjusted when either of the electric tape adjustments took place, a datum correction of +0.07 ft was applied from 4/14/2010 through the end of the water year since this would make the gage height match the rating before the electric tape was adjusted. No other datum corrections took place during the water year.
Datum Corrections.--	Levels have not been run at this site before.
Rating.--	The control is a standard 6-ft. concrete Parshall flume. Rating No. 1 (LOSODVCO01), a standard 6-ft. Parshall flume rating above a gage height of 0.15 ft, was used the entire water year. The flows below a gage height of 0.15 ft. are assumed to be 0. This is caused by the intake to the stilling well is 0.15 ft. above the floor of the flume or the stilling well does not provide sufficient depth. No measurements were made this water year because the flume is located underground. The peak flow of 115 cfs occurred at 0115 on 4/17/2010 at a gage height of 2.67 ft. (gage height correction of +0.07 ft applied) with a shift of 0.00 ft.
Discharge.--	For safety concerns, no measurement of this diversion has taken place. The discharge record was computed by direct application of the rating to the gage height record.
Special Computations.--	Comparison of the electronic record and paper chart in conjunction with the Bureau's site log book entries was necessary to determine what if any changes were made to the shaft encoder during the changes to the length of the electric tape gage. The average gage height at the diversion for WY08, 09, and 10 was 0.15 ft. This was used as the basis to estimate the changes to the electric tape length made by the bureau this water year. Final electric tape length was estimated using the -0.07 ft shaft encoder correction on 4/14/2010. All tape length change estimates were based on the premise that the shaft encoder was not changed during either of the tape length changes.
Remarks.--	Record is rated as poor for the entire period of record. A poor rating was given due to the uncertainty of the true gage height of the diversion and the fact that levels have never been run at this site to determine the orientation of the flume or true elevation of the floor of flume; also that measurements have never taken place due to the inaccessibility of the flume. Station maintained and record developed by Brian Leavesley.

Recommendations.--

Levels should be run at this site. Power issues should be resolved within the control house to allow for the installation of a SDR unit in place of the shaft encoder unit.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE OSO DIVERSION NEAR CHROMO

RATING TABLE--

LOSODVCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

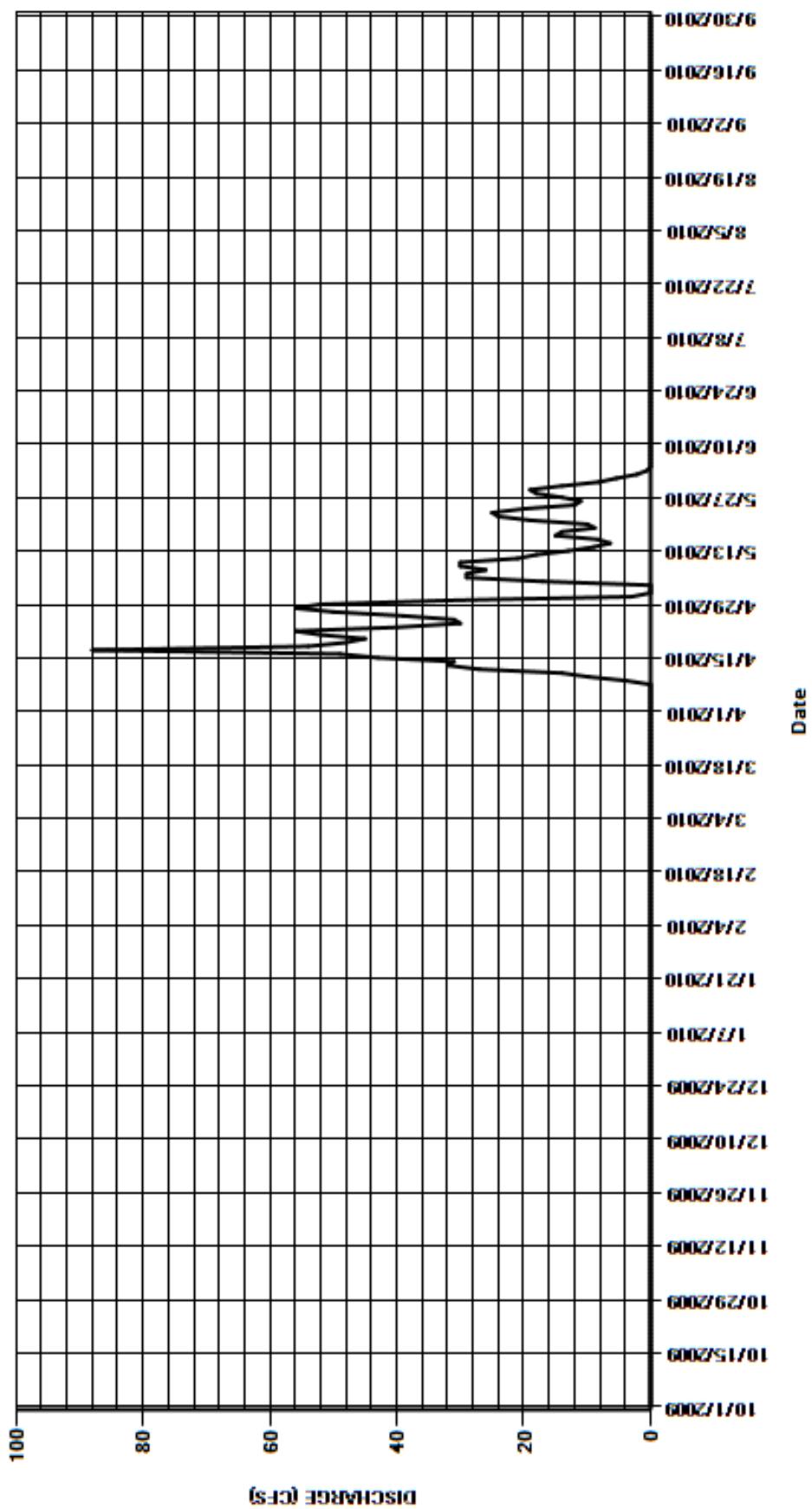
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	3	5.4	0	0	0
2	0	0	0	0	0	0	0	0	2.2	0	0	0
3	0	0	0	0	0	0	0	0	0.59	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	17	0	0	0	0
6	0	0	0	0	0	0	0	29	0	0	0	0
7	0	0	0	0	0	0	0	29	0	0	0	0
8	0	0	0	0	0	0	0	26	0	0	0	0
9	0	0	0	0	0	0	3.8	30	0	0	0	0
10	0	0	0	0	0	0	9.8	30	0	0	0	0
11	0	0	0	0	0	0	14	21	0	0	0	0
12	0	0	0	0	0	0	27	18	0	0	0	0
13	0	0	0	0	0	0	32	13	0	0	0	0
14	0	0	0	0	0	0	31	9	0	0	0	0
15	0	0	0	0	0	0	43	6.4	0	0	0	0
16	0	0	0	0	0	0	49	8.3	0	0	0	0
17	0	0	0	0	0	0	88	15	0	0	0	0
18	0	0	0	0	0	0	54	14	0	0	0	0
19	0	0	0	0	0	0	48	8.8	0	0	0	0
20	0	0	0	0	0	0	45	10	0	0	0	0
21	0	0	0	0	0	0	52	19	0	0	0	0
22	0	0	0	0	0	0	56	24	0	0	0	0
23	0	0	0	0	0	0	40	25	0	0	0	0
24	0	0	0	0	0	0	30	20	0	0	0	0
25	0	0	0	0	0	0	31	12	0	0	0	0
26	0	0	0	0	0	0	39	11	0	0	0	0
27	0	0	0	0	0	0	50	14	0	0	0	0
28	0	0	0	0	0	0	56	18	0	0	0	0
29	0	0	0	0	---	0	52	19	0	0	0	0
30	0	0	0	0	---	0	32	14	0	0	0	0
31	0	---	0	0	---	0	---	8.2	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	882.60	471.70	8.19	0.00	0.00	0.00
MEAN	0	0	0	0	0	0	29.4	15.2	0.27	0	0	0
AC-FT	0	0	0	0	0	0	1750	936	16	0	0	0
MAX	0	0	0	0	0	0	88	30	5.4	0	0	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

CAL YR	2009	TOTAL	1551.90	MEAN	4.25	MAX	59	MIN	0	AC-FT	3080
WTR YR	2010	TOTAL	1362.49	MEAN	3.73	MAX	88	MIN	0	AC-FT	2700

MAX DISCH: 115 CFS AT 01:15 ON Apr. 17,2010 GH 2.67 FT. SHIFT 0 FT. (GH CORR. +0.07 FT APPLIED)
 MAX GH: 2.67 FT. AT 01:15 ON Apr. 17,2010 (GH CORR. +0.07 FT APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE OSO DIVERSION NEAR CHROMO
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH
Water Year 2010

Location.--	Lat. 37°04'37.8", Long. 106°48'41.3", in SW ¼ SE ¼ sec. 23, T.33 N., R.1 E., NMPPM, Archuleta County, on right bank downstream from Little Oso Diversion Dam.
Drainage and Period of Record.--	N/A. December 5, 1996 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on separate floats in a wooden shelter and concrete well. On May 20, 2010, the shaft encoder was replaced with a Sutron stage-discharge recorder (SDR) unit on a separate float. The primary reference gage is a drop tape in the gage with an outside staff gage used for supplemental purposes. Control is a steel 5-foot Parshall flume set in concrete. No other changes.
Hydrologic Conditions.--	The channel is straight for approximately 80-ft up and downstream of the control. The gage is located approximately 80-ft downstream of the Little Oso Diversion Dam. A large CMP culvert is located approximately 80-ft downstream of the gage. Snow, ice, trash and debris can collect in front of the CMP culvert and submerge the flume. The channel consists of small cobbles and sand.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 26 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder and SDR units were not adjusted throughout the water year. There was a -0.02 ft correction on 10/13/2010 in WY11, however the correction will be applied totally in WY11. Record is complete and reliable except for the following days when ice on the control affected the stage-discharge relationship, the downstream culvert plugged with snow and caused a backwater effect at the gage, or when the circuit breaker failed in the winter resulting in the heater in the gage house not operating and allowing the well to freeze with the recorder floats in the ice.: Ice on the control: Dec. 19-24, 2009 . Backwater affected: Mar. 3-4, 13, 17-19, 30, 2010 . Well became frozen and no gage height was recorded: Dec. 9-18, 2009.
Datum Corrections.--	No levels were run this year. Levels have never been run at this gage.
Rating.--	The control is a 5-foot parshall flume installed in October 1996 to supplement an inverted Cipolletti weir at the Bureau's diversion structure. Sandbars above the flume cause some shifting. Rating No. 1, a standard 5 foot Parshall flume rating, was used for the entire period of record. Fifteen measurements (Nos. 193-207) were made during the current water year ranging in discharge from 1.05 cfs to 30.8 cfs. The measurements cover the range-in-stage experienced except for the higher average daily flows of May 4-5, and June 5-8, 2010. The instantaneous peak flow of 50.4 cfs occurred at 2045 on May 4, 2010 at a gage height of 1.81 ft with a shift of -0.02 ft. It exceeded measurement No. 199, made May 20, 2010, by 0.52 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were both distributed by stage with consideration given to change-in-stage and by time prorated by flow events. Shifts were distributed by stage using shift curve LITOSOCOVS09A from 0000 Oct. 01, 2009 until 1015 Oct. 19, 2009. Variable shift LITOSOCOVS10A was used from 1100 Oct. 19, 2009 until 1600 July 16, 2010. After this, shifts were distributed by time, with changes in shift prorated across flow events such as rainfall and reservoir operations at the diversion. Shifting is mainly caused by erosion and deposition of sand and silts on the approach section above the flume. The USBR periodically opens the gate to the diversion stilling basin above the station and releases a large amount of silt and gravel upstream of the flume. Measurements show shifts varying from -0.05 to +0.02 feet. Shifts were applied directly and given full weight except Measurement Nos. 196, 198, 199, 200, 201 and 203, were discounted from -6% to 6% to smooth shift distribution. Measurements Nos. 194-195 were not used in the shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records from the Navajo River at Banded Peaks gage station and partial days of good record.
Remarks.--	Record fair, except for those periods of ice affected record and when the floats were frozen in the well, which should be considered poor. Station maintained by Sherry Schutz and record developed by Brian Leavesley.
Recommendations.--	Benchmarks should be established and levels should be run at the gage. The level of the flume should be checked as well. Station is in need of repair work: shingles are falling off and could use a coat of paint or stain.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH

RATING TABLE--

LITOSOCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	2.7	1.4	1.3	1.3	1.3	5.4	27	27	5.1	3.2	2.9
2	1.6	2.6	1.4	1.3	1.3	1.3	4.5	26	27	5	2.7	2.5
3	1.7	2.3	1.2	1.3	1.3	e1.4	3.8	24	27	5.5	5.4	2.3
4	1.7	2.2	1.2	1.3	1.3	e1.6	4.8	32	30	4.5	6	2.2
5	1.7	2	1.6	1.3	1.3	1.7	6.1	33	33	4.1	5.6	2.1
6	1.7	1.9	1.3	1.3	1.3	1.5	5.4	28	36	3.9	3.4	2.1
7	2	1.9	1.5	1.3	1.4	1.5	4.9	28	35	3.8	2.9	2
8	2.5	1.9	1.6	1.3	1.4	1.6	7.6	29	32	3.8	2.9	4.2
9	2.3	1.8	e1.4	1.3	1.3	1.6	10	29	28	3.9	2.7	3.8
10	2.1	1.7	e1.2	1.3	1.4	1.6	11	29	25	3.5	2.5	2.7
11	2.1	1.7	e1.2	1.3	1.4	1.6	13	29	22	3.3	2.4	2.5
12	1.9	1.7	e1.3	1.3	1.3	1.6	8.5	29	20	3.2	2.4	2.3
13	2	1.8	e1.4	1.3	1.4	e1.7	6.3	29	17	3	2.5	2.3
14	2.1	1.8	e1.4	1.3	1.4	1.7	5.5	28	15	2.9	2.2	2.2
15	2.1	1.5	e1.3	1.3	1.4	1.6	5.7	29	14	2.8	2.1	2.2
16	2	1.5	e1.4	1.3	1.4	1.7	6	29	12	2.7	2.2	2.2
17	1.9	2	e1.4	1.3	1.4	e2.1	5.6	29	11	2.7	3.2	2.1
18	1.8	2.6	e1.4	1.3	1.4	e3	5.5	29	10	2.8	2.2	2.1
19	1.8	2.5	e1.4	1.4	1.4	e3.2	5.6	29	9.5	2.6	2.2	2.1
20	1.8	2.3	e1.4	1.4	1.5	2.4	5.6	28	8.8	2.5	2.4	2.2
21	2.1	2.4	e1.4	1.4	1.6	2.3	5.7	28	8.2	2.7	2	2.2
22	2.2	2.2	e1.4	1.4	1.5	2.7	5.5	27	7.8	5	2	3.1
23	2.1	2.4	e1.4	1.4	1.5	3.1	5.5	27	7.3	5.9	2.1	4.5
24	2.1	1.8	e1.4	1.3	1.4	2.6	5.6	27	7	3.7	2.4	2.7
25	2.1	1.2	1.4	1.3	1.3	2.5	5.6	28	6.7	3	4.4	2.3
26	1.8	1.4	1.4	1.3	1.3	2.8	5.7	27	7	3.4	2.8	2.2
27	1.8	1.4	1.4	1.3	1.3	2.4	5.6	27	6.2	2.7	2.2	2.1
28	1.6	1.5	1.3	1.3	1.3	2.5	5.5	27	6	3.7	2.5	2.1
29	1.6	1.6	1.3	1.3	---	3.6	5.3	27	5.9	3	3	2
30	1.7	1.6	1.3	1.3	---	e5.6	7	27	5.4	3.1	6.4	2
31	1.9	---	1.4	1.3	---	6.3	---	27	---	3.5	4.6	---
TOTAL	59.5	57.9	42.5	40.8	38.5	72.1	187.8	872	506.8	111.3	95.5	74.2
MEAN	1.92	1.93	1.37	1.32	1.38	2.33	6.26	28.1	16.9	3.59	3.08	2.47
AC-FT	118	115	84	81	76	143	373	1730	1010	221	189	147
MAX	2.5	2.7	1.6	1.4	1.6	6.3	13	33	36	5.9	6.4	4.5
MIN	1.6	1.2	1.2	1.3	1.3	1.3	3.8	24	5.4	2.5	2	2

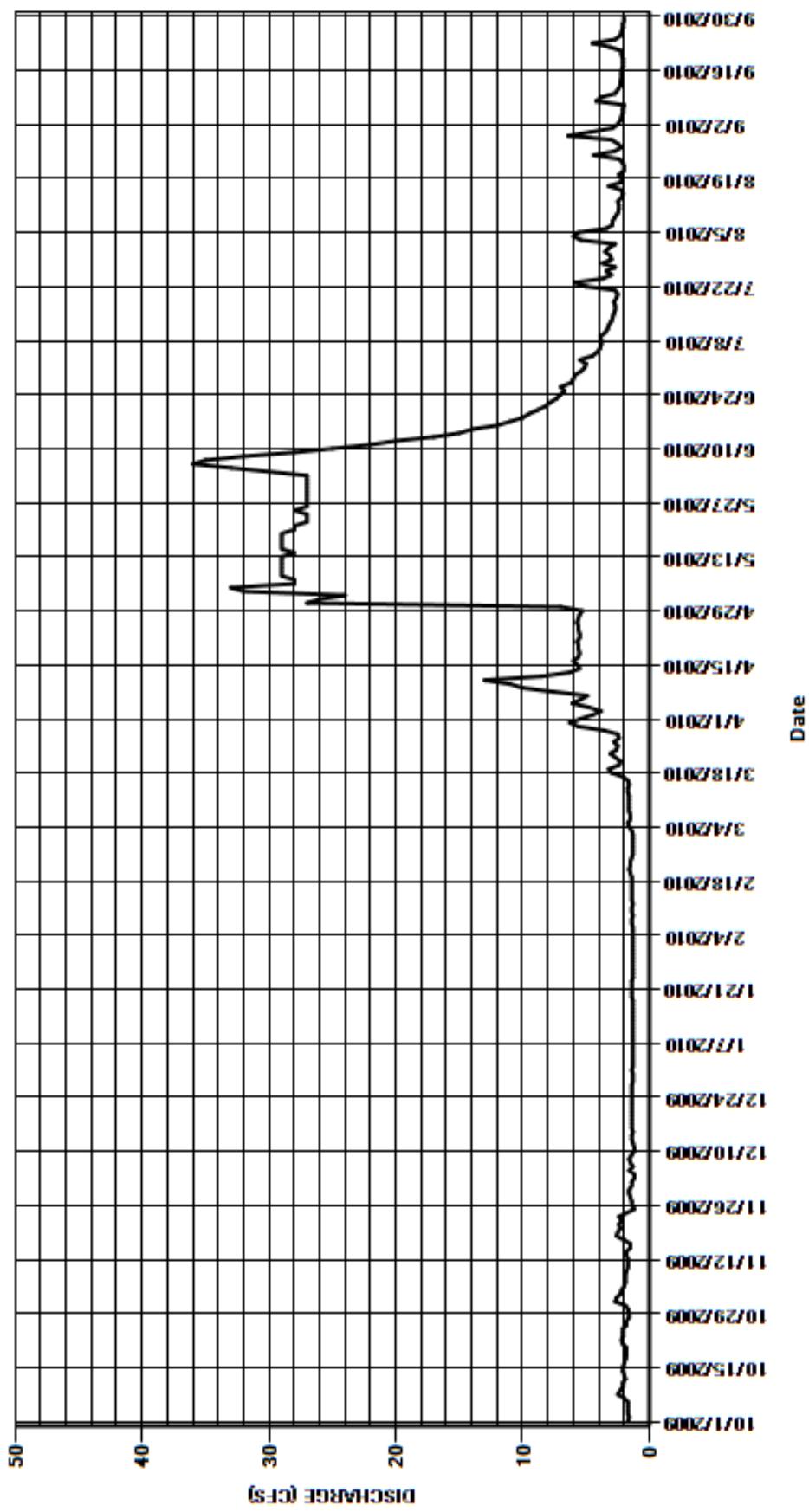
CAL YR	2009	TOTAL	2156.06	MEAN	5.91	MAX	31	MIN	0.96	AC-FT	4280
WTR YR	2010	TOTAL	2158.9	MEAN	5.91	MAX	36	MIN	1.2	AC-FT	4280

MAX DISCH: 50.4 CFS AT 20:45 ON May. 04,2010 GH 1.81 FT. SHIFT -0.02 FT.

MAX GH: 3.88 FT. AT 05:15 ON Mar. 30,2010 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
Water Year 2010

Location.-- Lat. 37°25'36", Long. 107°40'28", in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T.37 N., R.7 W., NMPM, La Plata County.

Drainage and Period of Record.-- 50.9 mi². July 1972 to current year.

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float located in a 72-inch by 72-inch exposed aggregate concrete shelter and a 42-inch corrugated metal pipe well. The floats are located inside of a 14 -inch PVC oil cylinder. A bubbler was installed at the gage on September 16, 2010 to help maintain good record during high flow events and winter periods when ice disks form within the oil cylinder. The station is also equipped with a Sutron air-temperature sensor. The primary reference gage is an electric drop tape with a separate steel drop tape used when the well is frozen around the oil cylinder. No other changes this water year.

Hydrologic Conditions.-- Large cobbles and boulders line the channel above and below the concrete ramp flume. The concrete ramp flume creates a large stilling pool above the control. Lemon Reservoir is below the gage but does not create backwater effect as the gage is well above the pool elevation in the reservoir.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record used for backup purposes. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. There was a -0.02 ft datum correction on Jan. 5, 2010 caused by an ice disk under the oil in the oil cylinder. The correction was distributed by time back to the previous site visit. No shaft encoder adjustments or flush corrections were necessary this water year. The record is complete and reliable except for the following days when ice on the control affected the gage height: Dec. 8, 10-16, 25-28, 2009.

Datum Corrections.-- Levels were not run this water year. Levels were last run on July 31, 2008 to the electric tape reference (ET), located inside the gage shelter, using BM2 as the base. Bench mark #2 (BM2) is a square chiseled into a large boulder located 3.5 ft. south of the bank operated cableway. The electric tape index was found to be reading +0.003 ft. high. The electric tape length was found to be reading 0.03 ft. long. No changes were made.

Rating.-- On April 2, 2002 a long throated flume, also known as a ramp flume was activated to act as the control section for the gage. The ramp flume is located about 75 feet below the inlets to the old gage and 5 feet below the new gage. Rating No. 7, in use since April 4, 2006, was continued in use for the duration of WY 2010. It is fairly well defined from 5.50 to 999 cfs. Fourteen measurements (Nos. 627-640) were made during the water year. They range in discharge from 5.72 cfs to 310 cfs. They cover the range in stage experienced accept for the lower average daily flows of Dec. 3-8, 2009, Jan. 21, 22, Feb. 11, 12, 15, 23, 2010 and the higher average daily flows of May 10, 18, 20-31, June 1-7, 2010. The peak instantaneous flow of 941 cfs occurred at 2100 on May 28, 2010 at a gage height of 3.83 ft with a shift of -0.01 ft. It exceeded the stage of measurement No. 634 by 1.03 feet in stage.

Discharge.-- Shifting control method was used during the entire water year. Shifting is caused mainly by aquatic growth on the ramp flume and the fill and scour of sand and gravel above the concrete ramp flume. Measurements show shifts varying from -0.06 to +0.01 feet. Shifts were distributed by time from the beginning of the water year 0000 on Oct. 1, 2009 until 1525 on Mar. 2, 2010. Shifts were distributed by stage for the remainder of the water year, using variable shift curve FLOALECOVS10. Shifts were applied directly and given full weight except measurement Nos. 628, 629, 630, 633, 635, 638, and 639 which were discounted from -7% to 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and temperature data obtained from a temperature sensor at the gage house. No measurements were made during the ice affected period.

Remarks.-- Record good, except for estimated daily discharges during ice affect, which are poor. Station maintained by Div 7 staff and record developed by Jason Morrow.

Recommendations.-- No recommendations this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO

RATING TABLE--

FLOALECO07 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

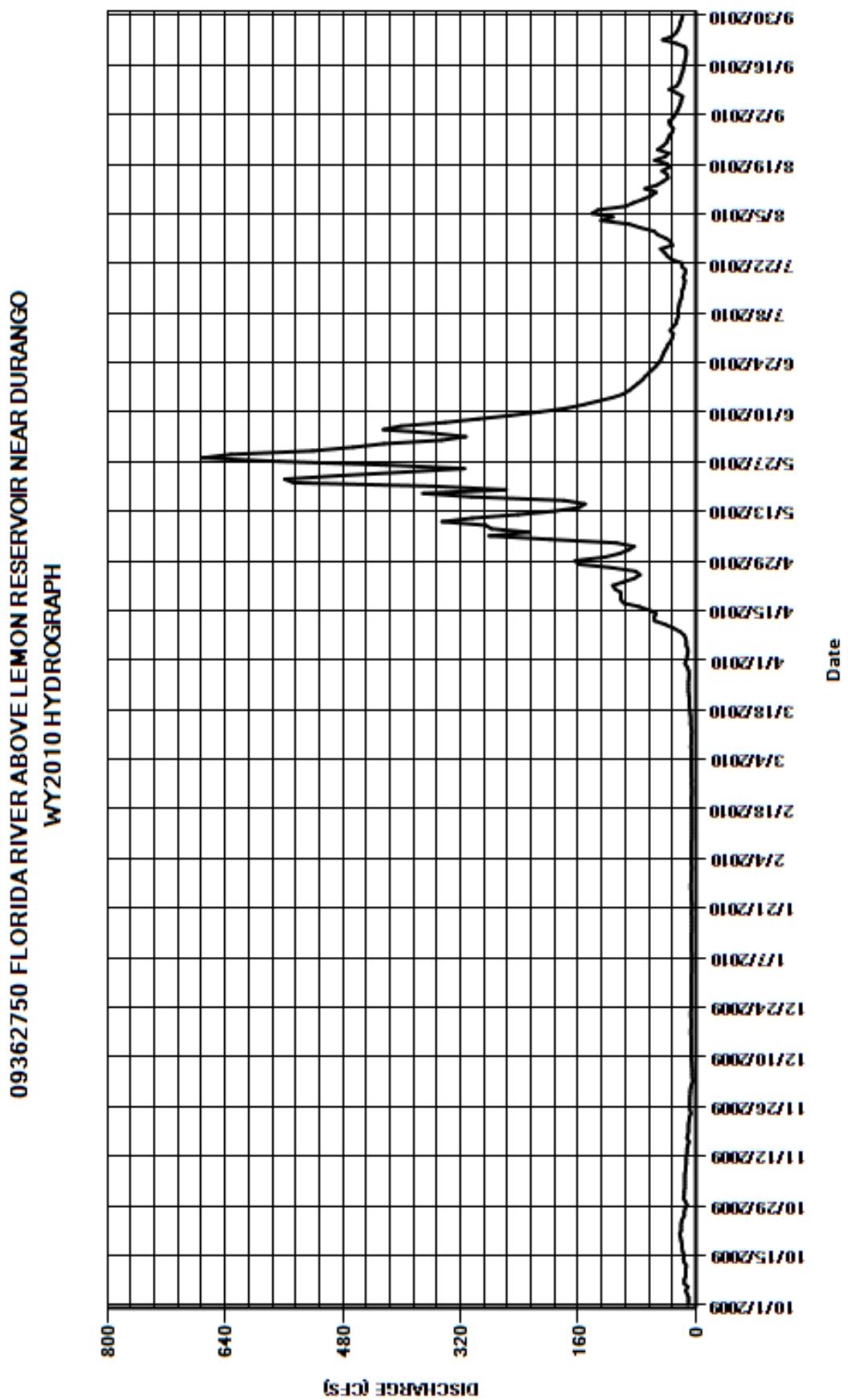
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	16	7.2	6.2	6	6.1	13	104	424	32	76	31
2	10	16	6.3	6.2	6.1	6.1	12	92	346	31	91	28
3	10	15	4.3	6	6.4	6.2	11	84	313	35	129	25
4	12	15	4.9	6	6.5	6.4	11	108	359	31	113	23
5	14	15	5.1	6	6.3	6.7	13	198	425	27	141	21
6	11	15	5.2	6.1	6.3	6.2	13	281	401	26	133	20
7	16	15	5.5	6	6.4	6.8	14	227	341	24	96	18
8	16	14	e5.5	6	6.3	6.8	16	278	296	24	85	26
9	14	14	6.3	6.2	6.1	6.3	22	286	252	24	72	36
10	14	13	e6.3	6.2	5.9	6.5	31	345	212	23	61	26
11	14	13	e6.5	6.1	5.7	6.1	42	304	177	22	54	23
12	13	13	e6.5	6.1	5.7	6	56	242	153	20	69	21
13	16	12	e6.6	6.1	5.9	6.5	57	192	134	19	53	20
14	17	12	e6.6	6.1	5.9	7.3	54	159	114	19	45	18
15	16	11	e6.6	5.9	5.7	6.7	63	151	99	17	38	17
16	18	9.5	e6.8	5.9	5.9	7.2	77	179	91	16	39	16
17	19	12	6.8	5.9	5.8	7.8	98	305	85	15	46	15
18	19	11	6.7	5.9	5.9	8.4	102	371	79	17	37	14
19	20	10	6.6	6.1	6.2	8.9	102	258	73	15	39	13
20	21	10	6.6	6.1	6.2	9.1	102	354	69	14	56	13
21	22	10	6.7	5.6	6.3	8.8	110	547	64	19	42	15
22	20	9.3	6.7	5.6	6	9.6	113	559	59	19	37	27
23	20	8.6	6.7	6.3	5.6	10	98	485	54	33	52	45
24	20	6.8	6.2	6.4	6	10	84	396	50	39	45	32
25	19	8.1	e6.2	6.6	6.3	10	76	315	47	43	40	27
26	16	8.8	e6.2	6.8	5.9	10	82	421	45	48	38	24
27	16	8.2	e6.2	6.7	6.2	9.6	114	567	43	32	36	22
28	15	8	e6.4	6.7	6.3	9.2	160	671	40	34	32	21
29	12	8	6.8	6.6	---	10	164	632	38	41	31	19
30	14	7.7	6.5	6.5	---	12	124	521	34	52	35	18
31	17	---	6.2	6.3	---	15	---	466	---	57	37	---
TOTAL	492	345.0	193.7	191.2	169.8	252.3	2034	10098	4917	868	1898	674
MEAN	15.9	11.5	6.25	6.17	6.06	8.14	67.8	326	164	28	61.2	22.5
AC-FT	976	684	384	379	337	500	4030	20030	9750	1720	3760	1340
MAX	22	16	7.2	6.8	6.5	15	164	671	425	57	141	45
MIN	10	6.8	4.3	5.6	5.6	6	11	84	34	14	31	13
CAL YR	2009	TOTAL	24324.2	MEAN	66.6	MAX	716	MIN	4.3	AC-FT	48250	
WTR YR	2010	TOTAL	22133.0	MEAN	60.6	MAX	671	MIN	4.3	AC-FT	43900	

MAX DISCH: 941 CFS AT 21:00 ON May. 28,2010 GH 3.83 FT. SHIFT -0.01 FT.

MAX GH: 3.83 FT. AT 21:00 ON May. 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



SAN JUAN RIVER BASIN
FLORIDA RIVER BELOW LEMON RESERVOIR
Water Year 2010

Location.-- Lat. 37°22'50", Long. 107°39'43", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.36 N., R.7 W., NMPPM, La Plata County

Drainage and Period of Record.-- 69.1 mi².

Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42 inch corrugated metal shelter and well. The primary reference gage is a steel drop tape referenced to a nonadjustable flat head screw set into the wooden instrument shelf. An electric tape is a redundant reference. It was removed on October 19, 2010. A tipping bucket rain gage (Texas Electronics, TR-525USW) was installed at the gage to measure precipitation. The gage is located within the stilling pool below the reservoir. The control is a concrete broad crested weir located approximately 200 ft. below the gage. A bank operated cableway is located approximately 400 ft. below the gage.
Hydrologic Conditions.--	The weir below Lemon Reservoir creates a large stilling pool below Lemon Reservoir dam. Flow in the channel is controlled by releases from the reservoir.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 15 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. The record is complete and reliable.
Datum Corrections.--	Levels were not run this water year. Levels were last run on July 31, 2008 to the nonadjustable reference (RP), located inside the gage shelter using BM1 as the base. The drop tape reference was found to be reading -0.003 ft. low. The drop tape reference was not adjusted as it was found to be within the allowable error tolerances. The drop tape length was reading correct and not adjusted.
Rating.--	The control is a concrete broad-crested weir located 200 ft. below the gage. Shifts occur as a result of moss growth on the weir. Rating No. 2, dated Jan. 11, 1977, was continued in use this year. It is well defined from 0.6 to 980 cfs. The point-of-zero-flow (PZF) was not measured this water year. The PZF is approximately 1.13 ft. Seventeen measurements (Nos. 499 - 515) were made during the current water year ranging in discharge from 8.62 cfs to 248 cfs. These measurements cover the range in stage experienced except for the lower average daily flows on Dec. 27-31, 2009; Jan. 1-18; Apr. 19, 20, 2010. The peak flow of 249 cfs occurred at 0945 on June 8, 2010 at a gage height of 3.21 ft. with a shift of +0.05 ft. The peak did not exceed the gage height of measurement No. 508, made June 15, 2010.
Discharge.--	Shifting control method was used, with shifts distributed by stage for most of the water year. Variable shift curve (FLOBLE09VSB) developed in water year 2009 and was used from 0000 on October 1, 2009 until 1238 on May 6, 2010. Variable shift curve (FLOBLE10VSA) was used from 1300 on May 6, 2010 until 0733 on September 10, 2010. Moss on the control impacted the shifts at the lower flows thus variable shift curve (FLOBLE10VSB) was used from 0800 on September 10, 2010 until 1519 on September 30, 2010. The moss was removed from the control on September 30, 2010 causing a -0.02 ft. correction. The correction was applied in the shifts and was distributed by time from 1600 September 30, 2010 until the end of the water year. Open water measurements show shifts varying from -0.06 to +0.05 feet. Shifts from measurement Nos. 499, 505, 506, 509, 510, 512, 514 and 515 were discounted to smooth shift distribution. Shifts were discounted -6% to +3%.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	Record good. Station maintained and record developed by Brian Boughton.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

FLORIDA RIVER BELOW LEMON RESERVOIR

RATING TABLE--

FLOBLECO02 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	9.3	8.8	8.3	8.8	8.8	9.3	9.7	236	181	148	120
2	11	9.3	8.8	8.4	8.8	8.9	9.2	9.7	239	184	142	120
3	11	9.3	8.8	8.5	8.8	8.8	9	9.7	243	184	132	120
4	11	9.3	8.8	8.5	8.8	8.8	9.1	9.7	243	183	124	120
5	11	9.3	8.8	8.5	8.8	8.8	9.3	9.7	243	180	120	118
6	11	9.3	8.8	8.5	8.8	8.8	9.3	9.8	245	183	120	118
7	10	9.3	8.8	8.2	8.8	8.8	9.3	9.7	246	192	120	118
8	10	9.3	8.8	8.3	8.8	8.8	9.3	10	246	198	120	118
9	10	9.3	8.8	8.4	8.8	8.8	9.3	10	246	204	120	113
10	10	9.3	8.8	8.4	8.8	9	9.3	10	246	204	120	109
11	10	9.3	8.8	8.4	8.8	9	9.3	10	246	201	125	106
12	10	9.3	8.8	8.4	8.8	9.1	9.3	10	248	204	129	100
13	9.9	9.3	8.8	8.4	8.8	9.1	9.3	10	248	212	129	99
14	9.8	9.3	8.8	8.4	8.8	9.3	9.3	10	248	211	129	99
15	9.9	24	8.8	8.4	8.8	9.3	9.3	10	248	211	129	103
16	9.7	61	8.8	8.3	8.8	9.3	9.3	19	248	210	134	106
17	9.8	61	8.8	8.4	8.8	9.3	9.3	53	248	209	141	106
18	9.7	61	8.8	8.5	8.8	9.3	9.3	54	240	209	139	106
19	9.7	61	8.8	8.8	8.8	9.3	8.5	69	232	207	139	106
20	9.8	61	8.8	8.8	8.8	9.3	7	97	226	206	139	106
21	9.7	45	8.8	8.8	8.8	9.3	9.3	131	212	198	139	106
22	9.7	8.8	8.8	8.8	8.8	9.3	9.3	157	204	183	139	106
23	9.7	8.8	8.8	8.8	8.8	9.3	9.3	167	204	177	139	58
24	9.7	8.8	8.8	8.8	8.8	9.3	9.4	181	204	177	139	9.3
25	9.7	8.8	8.8	8.8	8.8	9.3	9.6	205	204	165	139	9.3
26	9.7	8.8	8.7	8.8	8.8	9.3	9.7	220	204	153	139	9.3
27	9.7	8.8	8.3	8.8	8.8	9	9.7	231	202	148	139	9.5
28	9.7	8.8	8.3	8.8	8.8	8.9	9.7	236	196	148	139	9.5
29	9.7	8.8	8.3	8.8	---	9.1	9.7	234	193	148	139	9.7
30	9.5	8.8	8.6	8.8	---	9.3	9.7	235	185	148	133	9.6
31	9.3	---	8.6	8.8	---	9.3	---	235	---	148	126	---
TOTAL	310.4	583.4	270.8	265.6	246.4	282.0	277.7	2672.0	6873	5766	4109	2547.2
MEAN	10	19.4	8.74	8.57	8.8	9.1	9.26	86.2	229	186	133	84.9
AC-FT	616	1160	537	527	489	559	551	5300	13630	11440	8150	5050
MAX	11	61	8.8	8.8	8.8	9.3	9.7	236	248	212	148	120
MIN	9.3	8.8	8.3	8.2	8.8	8.8	7	9.7	185	148	120	9.3

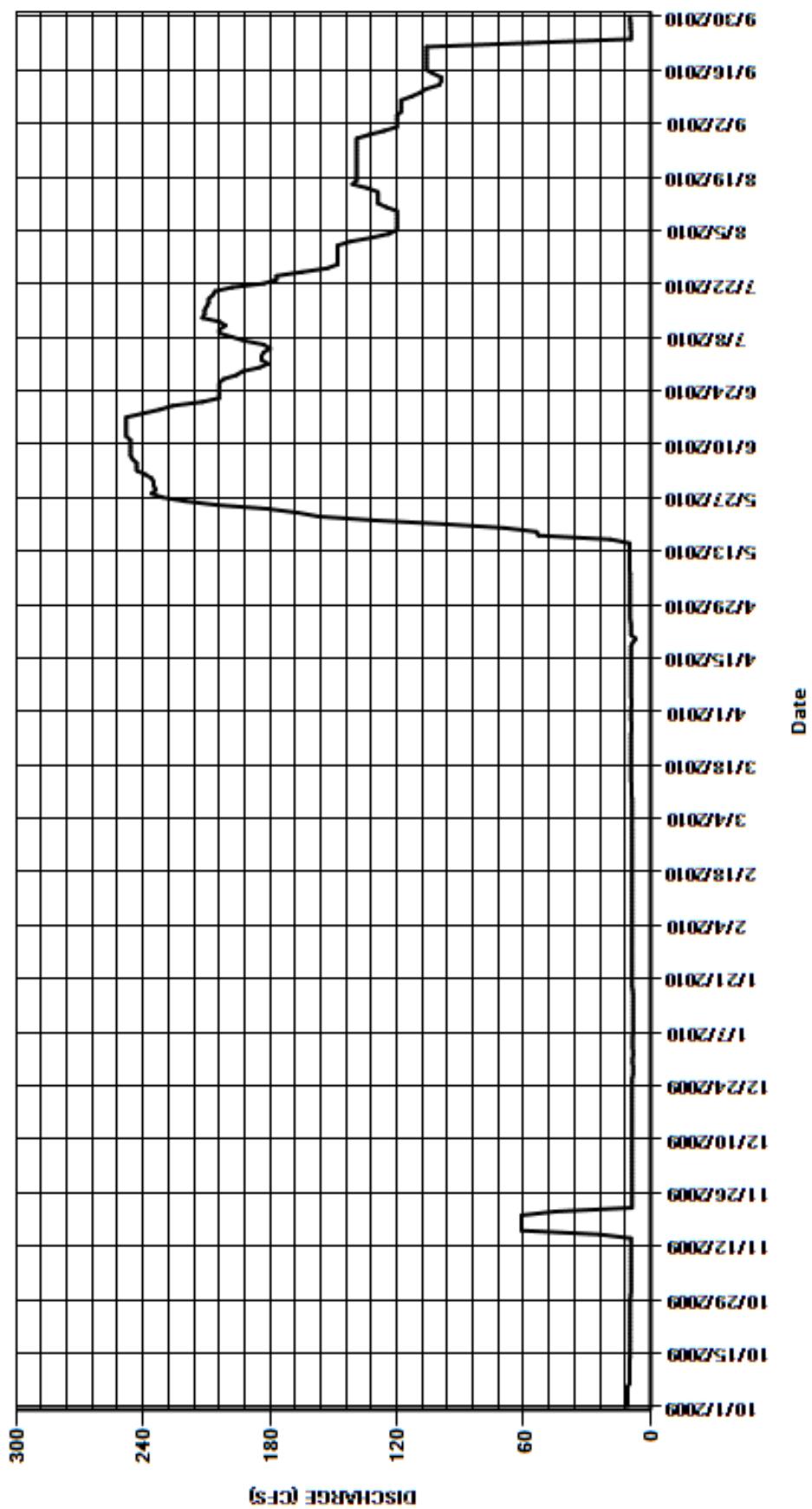
CAL YR	2009	TOTAL	31224.0	MEAN	85.5	MAX	489	MIN	8.3	AC-FT	61930
WTR YR	2010	TOTAL	24203.5	MEAN	66.3	MAX	248	MIN	7	AC-FT	48010

MAX DISCH: 249 CFS AT 09:45 ON Jun. 08,2010 GH 3.21 FT. SHIFT 0.05 FT.

MAX GH: 3.21 FT. AT 09:45 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

FLORIDA RIVER BELOW LEMON RESERVOIR
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09357500 ANIMAS RIVER NEAR HOWARDSVILLE
Water Year 2010

Location.--	Lat. 37°49'59", Long. 107°35'56", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T.41 N., R.7 W., NMPM, San Juan County
Drainage and Period of Record.--	55.9 mi ² . May 1936 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 36"x 36" wooden shelter and well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature sensor is located at the gage as well. The control is a cobble riffle located approximately 50-ft. below the gage.
Hydrologic Conditions.--	Drainage area consists of forested mountains with many rocky peaks above 11,000 ft. in elevation. Cobbles and boulders line the channel above and below the gage. Avalanches above the gage can diminish the flows at the gage but the events are typically short lived.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 13 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 1 time this water year (June 29, 2010). The adjustment made was +0.01 feet. The correction was distributed by time to the last known matching reading. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 16, 24, 25, 27, 30, Dec. 1-11, 13-21, 23-28, 31, 2009; Jan. 1, 3-5, 7-13, 15, 16, 18, 21-26, 30, 31, Feb. 1-3, 5, 11-13, 15, 17, 18, 22-24, 26, 27, Mar. 2, 4, 6, 9, 12, 13, 15-17, 20-22, 25, 28, 29, Apr. 7-9, 2010.
Datum Corrections.--	Levels were not run this water year. Levels were last run on July 15, 2008, using BM1 as the base. No corrections were made as the drop tape index and drop tape length was found to be within allowable tolerances.
Rating.--	One channel at all stages. The control is a large cobble riffle located below the station. The channel controls at high flow. Gravel and sand fill and scour, causing shifts. Rating No. 09, instituted on May 13, 2009, was used for the entire water year. Thirteen measurements (Nos. 1186 - 1198) were made during the current water year ranging in discharge from 12.8 to 478 cfs. They cover the range in stage experienced except for the lower average daily flows of Feb. 23, 2010 and the higher average daily flows of May 27-31; June 1-11, 2010. The measurements before the peak plotted on the rating but tended to move to the right after the peak flow. The peak flow of 1310 cfs occurred at 1900 on June 5, 2010 at a gage height of 3.79 ft. with a shift of 0.00 ft. The peak exceeded measurement No. 1193 by 1.17 ft. in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of small cobble and gravels on the control section below the gauge. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from 0000 Oct. 1, 2009 until 1217 Mar. 29, 2010 (the last measurement before runoff began). Shifts were distributed by stage using shift curve ANIHOWCOVS10A from 1300 Mar. 29, 2010 until the peak at 1900 Jun. 5, 2010. The descending limb of the hydrograph was defined by measurements 1194 to 1198 and shift curve ANIHOWCOVS10B. Shift curve 10B was applied from the peak (1900 Jun. 5, 2010) until 1041 Sep. 9, 2010. Shifts were distributed by time from 1100 Sep. 9, 2010 (meas. no. 1198) until 1231 Oct. 4, 2010 (meas. no. 1199). Unadjusted measurements show shifts varying from -0.03 to 0.08 ft. Shifts associated with measurement Nos. 1189, 1190, 1192, 1193, 1194, 1195, 1197 and 1198 were adjusted from -3% to +4% to smooth shift distribution. The shift for measurement nos. 1187 and 1188 were not used because they appear to be affected by ice.
Special Computations.--	Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, air temperature data collected at the gage, and two measurements at the gage during ice effect.
Remarks.--	Record good, except for the winter periods affected by ice, which should be considered poor. Station maintained by Div 7 staff and record developed by Jason Morrow.
Recommendations.--	Currently the existing cable way is a wooden "A" frame with a suspended cable and cable car. The cable car is a 2-person sit-down car with real mount. For safety reasons the existing cableway should be removed and a new bank-operated cable way should be installed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09357500 ANIMAS RIVER NEAR HOWARDSVILLE

RATING TABLE--

ANIHOWCO09 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

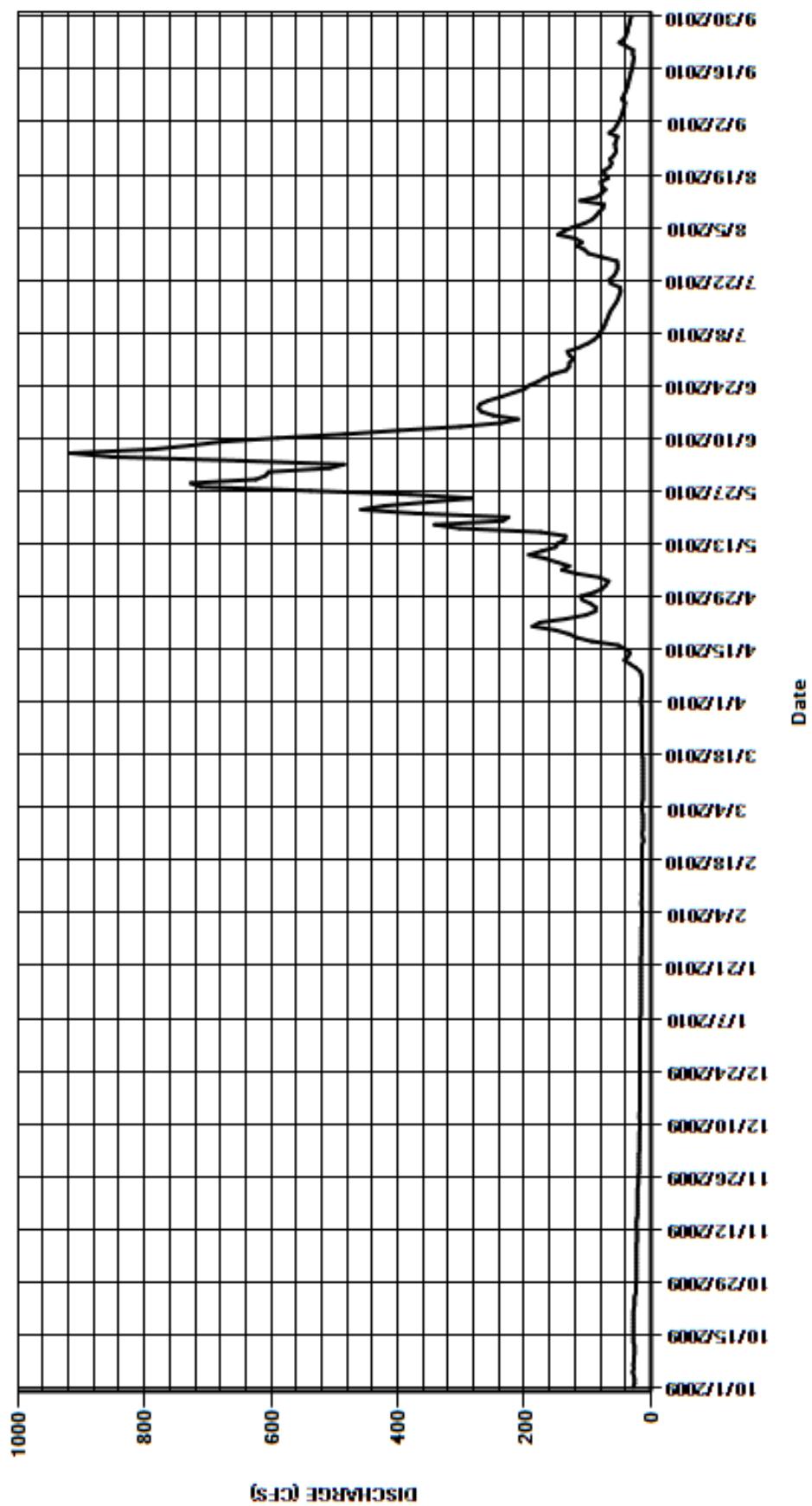
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	23	e19	e17	e14	13	16	77	604	122	109	54
2	26	23	e19	17	e14	e13	15	71	508	129	120	51
3	26	23	e18	e17	e14	14	14	67	485	132	147	48
4	27	23	e18	e17	14	e14	14	81	651	114	137	46
5	29	23	e18	e17	e14	14	14	118	852	101	123	44
6	27	23	e18	17	15	e13	14	141	917	91	105	42
7	28	23	e18	e17	15	13	e14	129	787	84	93	41
8	27	23	e18	e16	14	13	e15	148	728	81	87	46
9	27	22	e17	e16	15	e13	e17	167	680	76	82	43
10	26	22	e17	e16	14	13	24	193	590	73	76	40
11	26	22	e18	e16	e14	13	33	172	484	71	74	38
12	26	23	18	e16	e14	e13	42	151	399	68	112	36
13	28	23	e18	e16	e14	e13	36	147	301	66	86	35
14	28	23	e17	16	14	13	33	136	237	63	78	33
15	28	22	e17	e16	e14	e13	41	135	210	59	72	32
16	28	e21	e17	e16	14	e13	52	174	249	55	78	30
17	28	21	e17	16	e14	e13	93	302	268	52	79	29
18	28	21	e17	e16	e14	14	117	342	273	50	68	28
19	28	21	e17	16	14	14	130	234	270	48	73	27
20	28	21	e17	16	14	e14	151	225	256	49	74	29
21	28	21	e17	e16	14	e14	187	371	236	63	65	28
22	27	21	17	e16	e14	e14	176	458	218	66	62	39
23	26	21	e17	e16	e12	14	134	421	200	59	65	50
24	26	e20	e17	e15	e13	14	103	352	192	55	59	42
25	26	e20	e17	e15	14	e14	88	282	178	53	55	39
26	24	20	e17	e15	e13	14	87	380	168	53	56	37
27	24	e19	e17	15	e13	14	95	538	155	54	57	36
28	24	19	e17	15	13	e14	108	711	134	77	55	34
29	23	19	17	15	---	e14	111	727	129	99	53	33
30	23	e19	17	e15	---	14	90	624	129	105	66	31
31	23	---	e17	e15	---	15	---	609	---	117	58	---
TOTAL	821	645	540	495	389	421	2064	8683	11488	2385	2524	1141
MEAN	26.5	21.5	17.4	16	13.9	13.6	68.8	280	383	76.9	81.4	38
AC-FT	1630	1280	1070	982	772	835	4090	17220	22790	4730	5010	2260
MAX	29	23	19	17	15	15	187	727	917	132	147	54
MIN	23	19	17	15	12	13	14	67	129	48	53	27
CAL YR	2009	TOTAL	39958	MEAN	109	MAX	884	MIN	13	AC-FT	79260	
WTR YR	2010	TOTAL	31596	MEAN	86.6	MAX	917	MIN	12	AC-FT	62670	

MAX DISCH: 1310 CFS AT 19:00 ON Jun. 05,2010 GH 3.79 FT. SHIFT 0 FT.

MAX GH: 3.79 FT. AT 19:00 ON Jun. 05,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09357500 ANIMAS RIVER NEAR HOWARDSVILLE
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
Water Year 2010

Location.-- Lat. 37°19'26", Long. 108°03'41", in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, T.35 N., R.11 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- Sutron Satlink 2 DCP with a shaft encoder in a wood shelter and 22" x 22" concrete well. Primary reference gage is a staff gage located on the inside of the stilling well. Control is a 5-foot concrete Parshall flume. No changes this year.

Hydrologic Conditions.-- The ditch above and below the control is sand, gravel, cobble and sparse small boulders with a very well defined stilling pool. The stilling pool fills with sand and gravel causing the approach velocity to increase. The approach conditions into the flume are good. Vegetative growth downstream of the flume rarely causes submergence but beavers have been known to build dams downstream of the flume.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data. There is no backup record except for satellite data. The gage was visited on 8 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference. Two adjustments were made to the shaft encoder. One on May 22, 2010 (+0.01 ft correction) and one on September 8, 2010 (-0.01 ft. correction). A +0.005 correction made on August 11, 2010 was ignored in the record. Record is complete and reliable except for October 1-7, 2009 when the float was stuck in mud.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 22, 2008 to the inside staff gage. The staff gage was found to be reading 0.006-ft high. No corrections were made as the staff gage was found to be within allowable tolerances.

Rating.-- The control is a standard 5-foot concrete Parshall flume. Rating No. 01, in use since the gage was installed, was used all year. Five discharge measurements (Nos. 36-40) were made this year, ranging in discharge from 3.61 cfs to 37.2 cfs. An observation of zero flow was made on October 16, 2009 and April 15, 2010. Measurements and observation of zero flow cover the range-in-stage experienced except for higher average daily flows of June 9 and August 3, 2010. The peak instantaneous flow of 40.2 cfs occurred at 2145 on June 9, 2010 at a gage height of 1.44 ft with a shift of 0.11 ft. It exceeded the stage of measurement No. 37, made June 9, 2010 by 0.11 feet in stage.

Discharge.-- Shifting control method was used all water year. Shifts were applied by stage. The Parshall flume has a positive longitudinal slope (the throat is lower than the entrance of the converging section). The stilling pool above the flume has filled in with sand and gravel causing higher approach velocities. The positive longitudinal slope along with the excessive approach velocities cause the shifts to plot to the right of a standard rating (positive shifts). Most measurements are made at the well intake with a few made approximately 60-ft upstream of the flume. Open-water measurements showed raw shifts varying between +0.03 and +0.15 feet. All measurements were given full weight except for measurements Nos. 36, 37, 39 and 40 which were discounted -4% to 5% to smooth shift distribution. Shift curve LPCDIT10VSA was applied throughout the entire period of record when water was flowing in the ditch.

Special Computations.-- – Discharge for the days when the float was stuck in the mud was estimated from the drop in flows at the La Plata River at Hesperus gage with some consideration given to water commissioner estimate. The water commissioner turned water into the ditch but did not check the gage.

Remarks.-- Record is complete, reliable and good except for October 1-7, 2009 when the float was stuck in mud. The record during this period is estimated and should be considered poor. Station maintained and record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS

RATING TABLE--

LPCDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e1.7	0	0	0	0	0	0	0	30	11	28	6.5
2	e1.5	0	0	0	0	0	0	0	32	12	33	5.7
3	e1.4	0	0	0	0	0	0	0	32	12	38	5
4	e1.2	0	0	0	0	0	0	0	33	11	36	4.3
5	e1	0	0	0	0	0	0	0	33	10	35	3.7
6	e0.8	0	0	0	0	0	0	0	34	9.5	32	3.1
7	e0.5	0	0	0	0	0	0	0	32	8.5	30	3.1
8	0	0	0	0	0	0	0	0	35	7.6	28	3.9
9	0	0	0	0	0	0	0	0	38	6.7	24	5.2
10	0	0	0	0	0	0	0	0	35	5.7	21	4.1
11	0	0	0	0	0	0	0	0	32	4.9	19	3.2
12	0	0	0	0	0	0	0	0	29	4.1	22	2.5
13	0	0	0	0	0	0	0	0	25	3.5	17	2.2
14	0	0	0	0	0	0	0	0	28	2.9	14	1.9
15	0	0	0	0	0	0	0	0	32	2.3	12	1.5
16	0	0	0	0	0	0	0	0	29	1.8	12	1.4
17	0	0	0	0	0	0	0	0	20	1.5	16	1.2
18	0	0	0	0	0	0	0	0	15	1	12	0.96
19	0	0	0	0	0	0	0	0	14	0.7	11	0.82
20	0	0	0	0	0	0	0	0	14	0.57	14	0.85
21	0	0	0	0	0	0	0	0	14	0.71	9.8	0.87
22	0	0	0	0	0	0	0	7.1	9.5	0.58	8.4	2.5
23	0	0	0	0	0	0	0	13	3.9	3	9.8	5.5
24	0	0	0	0	0	0	0	13	3.7	6.3	8.1	3.8
25	0	0	0	0	0	0	0	11	3.4	6.5	8.4	2.6
26	0	0	0	0	0	0	0	13	3.3	9.7	8.8	1.9
27	0	0	0	0	0	0	0	22	3.2	9.5	7.6	1.5
28	0	0	0	0	0	0	0	24	6.5	9	6.6	1.1
29	0	0	0	0	---	0	0	24	9.6	9.8	6.4	1.1
30	0	0	0	0	---	0	0	23	9.5	16	7.6	0.91
31	0	---	0	0	---	0	---	23	---	20	6.9	---
TOTAL	8.10	0.00	0.00	0.00	0.00	0.00	0.00	173.10	638.6	208.36	542.4	82.91
MEAN	0.26	0	0	0	0	0	0	5.58	21.3	6.72	17.5	2.76
AC-FT	16	0	0	0	0	0	0	343	1270	413	1080	164
MAX	1.7	0	0	0	0	0	0	24	38	20	38	6.5
MIN	0	0	0	0	0	0	0	0	3.2	0.57	6.4	0.82

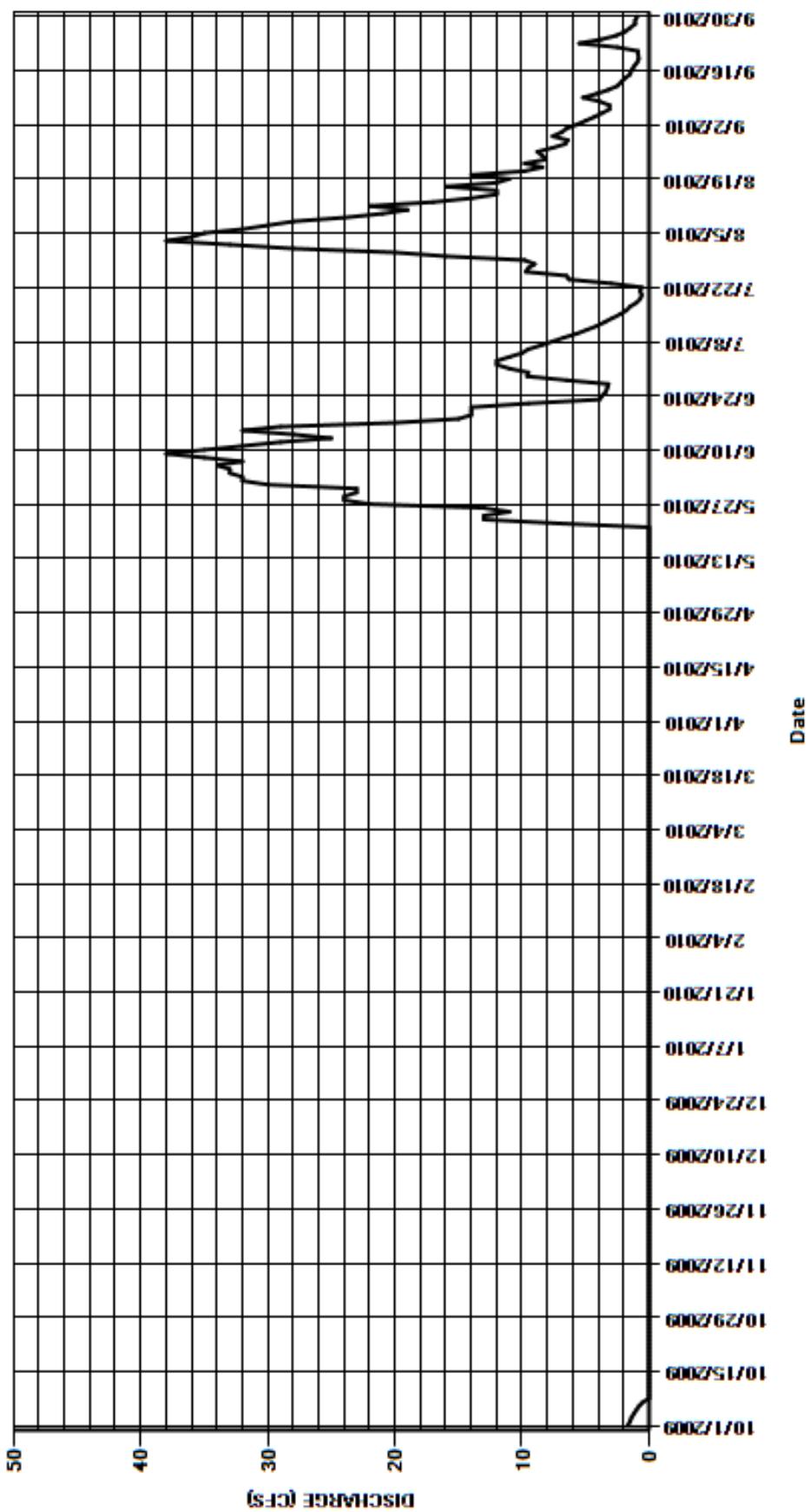
CAL YR	2009	TOTAL	1414.40	MEAN	3.88	MAX	35	MIN	0	AC-FT	2810
WTR YR	2010	TOTAL	1653.47	MEAN	4.53	MAX	38	MIN	0	AC-FT	3280

MAX DISCH: 40.2 CFS AT 21:45 ON Jun. 08,2010 GH 1.44 FT. SHIFT 0.11 FT.

MAX GH: 1.44 FT. AT 21:45 ON Jun. 08,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAPLATA AND CHERRY CREEK DITCH NEAR HESPERUS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
PINE RIDGE DITCH NEAR HESPERUS
Water Year 2010

Location.-- Lat. 37°17'31", Long. 108°02'07", in SW¼NE¼ sec. 14, T.35 N., R.11 W., NMPM, La Plata County.

Drainage and Period of Record.-- N/A

Equipment.-- Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 30-in diameter corrugated metal well and a 42-in diameter corrugated metal shelter. Primary reference gage is outside staff gage installed in flume (0.00-ft to 2.06-ft.). The control is a 3-foot steel Parshall flume with a depth of 2-ft. No other changes this year.

Hydrologic Conditions.-- The ditch above and below the control is silt and gravel with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume can cause submergence if the ditch is not maintained. On April 29, 2008 a 34 in x 50 in elliptical corrugated metal pipe was installed in the ditch approximately 200-ft below the gage. The culvert appears to be adequate and allows the flume to operate under free-flow conditions. The culvert was installed to access the Indian Shadows subdivision.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP. The gage was visited on 6 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. The record is complete and reliable, except for the following day when the stage discharge relationship was affected by snow and ice choking the flow in the ditch which caused the flume to submerge. The flume was submerged until the water cut a path through the snow and ice: Apr. 9, 2010.

Datum Corrections.-- Levels were not run this water year. Levels were last run on August 22, 2008.

Rating.-- The control is a standard, 3-foot, steel Parshall flume. Rating No. 01 in use since the gage was installed was used all water year. Rating No. 01 is a standard 3-ft Parshall flume rating above a gage height of 0.06-ft. Gage heights below 0.06-ft, the well become isolated as the invert of the intake is 0.06-ft. above the floor of the flume at the staff gage. Two discharge measurements Nos. 17 and 18 were made this year. They range in discharge from 4.28 to 11.1 cfs. Observations of zero flow were made on November 12, 2009 and August 11, 2010. Measurements and observation of zero flow cover the range -in-stage. The peak instantaneous flow of 13.5 cfs occurred at 1915 April 23, 2010 at a gage height of 1.10 ft with a shift of -0.02 ft. It exceeded the stage of measurement No. 18, made April 21, 2010 by 0.13 feet in stage. The peak instantaneous gage height at 1330 April 9, 2010 was 1.62 ft. The gage height was affected by snow and ice backing the water up into the flume.

Discharge.-- Shifts were applied as defined by measurements and were distributed by stage. Shift curve PINDITCOVS10A was applied throughout the entire period of record. Measurements are made at the staff gage and well intake, in the flume. All measurements made were given full weight.

Special Computations.-- Discharge for the day of ice affected record was estimated using the good data from the following day. It was assumed that the gate was not adjusted and the increase in flow was caused by the increase in head pressure from the rising stage of the river.

Remarks.-- Record good, except for Apr. 9, 2010 when the flume was affected by backwater from snow and ice buildup in the ditch. Record during this period should be considered poor. Station maintained and record developed by Brian Boughton.

Recommendations.-- None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PINE RIDGE DITCH NEAR HESPERUS

RATING TABLE--

PINDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	8.7	4.2	0	0	0
2	0	0	0	0	0	0	0	5.7	4.3	0	0.02	0
3	0	0	0	0	0	0	0	5.3	4.3	0	0	0
4	0	0	0	0	0	0	0	3.8	4.4	0	0	0
5	0	0	0	0	0	0	0	0	4.1	0	0	0
6	0	0	0	0	0	0	0	0	4	0	0	0
7	0	0	0	0	0	0	0	0	4	0	0	0
8	0	0	0	0	0	0	0	0	4.2	0	0	0
9	0	0	0	0	0	0	e1	0	4.3	0	0	0
10	0	0	0	0	0	0	1.7	0	4.3	0	0	0
11	0	0	0	0	0	0	3.7	0	4	0	0	0
12	0	0	0	0	0	0	4.8	1	4	0	0	0
13	0	0	0	0	0	0	4.8	2.5	3.8	0	0	0
14	0	0	0	0	0	0	5.4	2.4	1.6	0	0	0
15	0	0	0	0	0	0	6.4	2.4	0.11	0	0	0
16	0	0	0	0	0	0	6.9	2.4	0.08	0	0	0
17	0	0	0	0	0	0	6.6	2.7	0	0	0	0
18	0	0	0	0	0	0	4.8	2.6	0	0	0	0
19	0	0	0	0	0	0	7.5	3	0	0	0	0
20	0	0	0	0	0	0	9.6	4.7	0	0	0	0
21	0	0	0	0	0	0	11	3.3	0	0	0	0
22	0	0	0	0	0	0	9.9	3.2	0	0	0	0
23	0	0	0	0	0	0	9.8	3.4	0	0.03	0	0
24	0	0	0	0	0	0	11	3.6	0	0	0	0
25	0	0	0	0	0	0	11	3.6	0	0	0	0
26	0	0	0	0	0	0	11	4	0	0	0	0
27	0	0	0	0	0	0	11	4	0	0	0	0
28	0	0	0	0	0	0	11	4.3	0	0	0	0
29	0	0	0	0	---	0	11	4.4	0	0	0	0
30	0	0	0	0	---	0	11	4.2	0	0	0	0
31	0	---	0	0	---	0	---	4.1	---	0	0	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	170.90	89.30	55.69	0.03	0.02	0.00
MEAN	0	0	0	0	0	0	5.7	2.88	1.86	0.001	0.0006	0
AC-FT	0	0	0	0	0	0	339	177	110	0.06	0.04	0
MAX	0	0	0	0	0	0	11	8.7	4.4	0.03	0.02	0
MIN	0	0	0	0	0	0	0	0	0	0	0	0

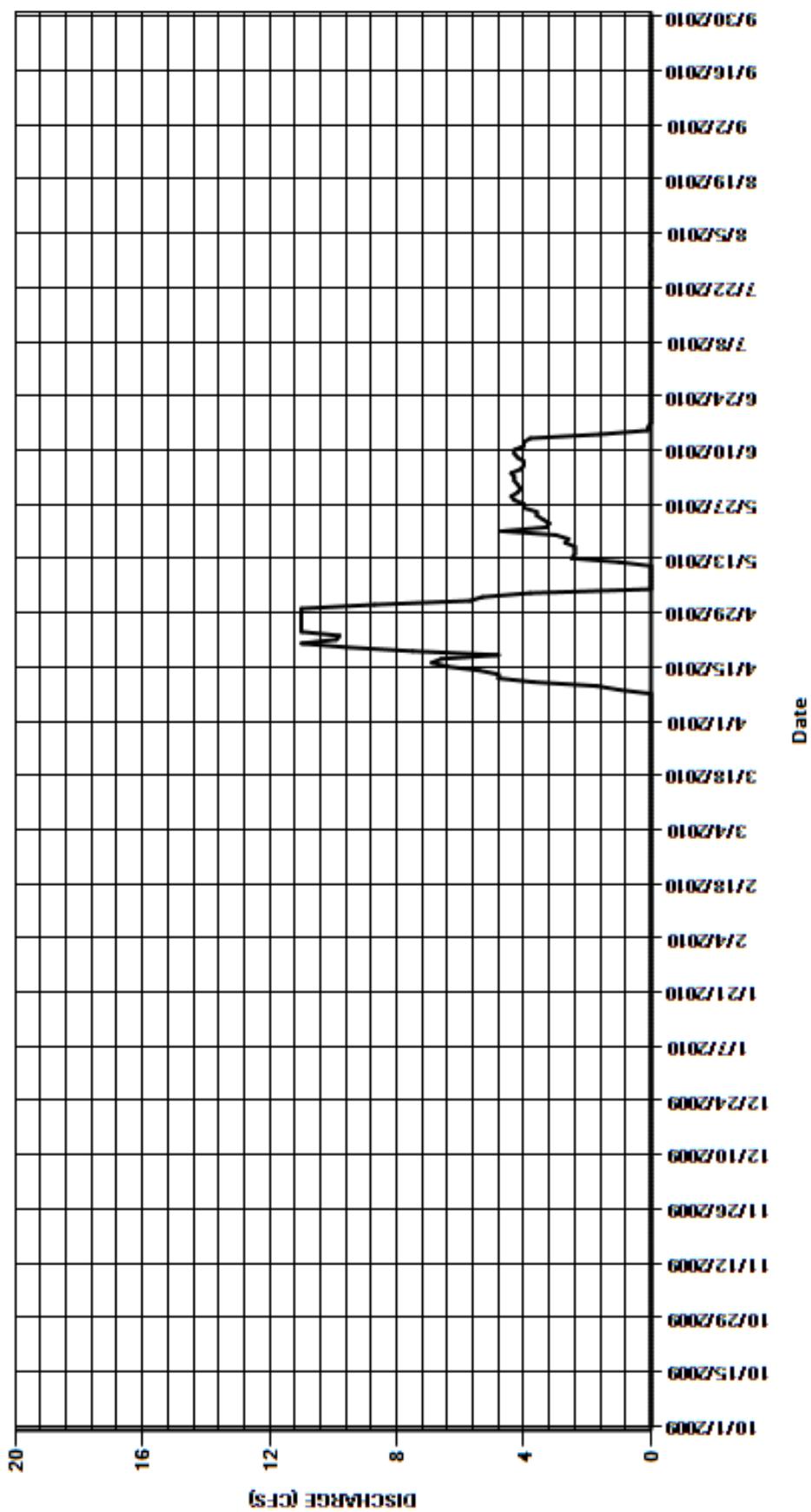
CAL YR	2009	TOTAL	413.71	MEAN	1.13	MAX	11	MIN	0	AC-FT	821
WTR YR	2010	TOTAL	315.94	MEAN	0.87	MAX	11	MIN	0	AC-FT	627

MAX DISCH: 13.5 CFS AT 19:15 ON Apr. 23,2010 GH 1.1 FT. SHIFT -0.02 FT.

MAX GH: 1.62 FT. AT 13:30 ON Apr. 09,2010 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PINE RIDGE DITCH NEAR HESPERUS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
09365500 LA PLATA RIVER AT HESPERUS
Water Year 2010

Location.--	Lat. 37°17'23", Long. 108°02'24", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T.35 N., R.II W., NMPM La Plata County, Hydrologic Unit 14080105, on right bank at Hesperus 700 ft downstream from U.S. Highway 160.
Drainage and Period of Record.--	37 mi ² , approximately. Periodic data June 1904 to Nov. 1910. Continuous from June 1917 to current year, with some periods of monthly data only.
Equipment.--	Graphic water-stage recorder and a Sutron Satlink 2 HDR DCP with a shaft encoder on a separate float in a 64" x 64" concrete block shelter and a 42" diameter corrugated metal well. The primary reference gage is an electric drop tape inside the gage house. The station is also equipped with a Sutron air temperature sensor and an electric float tank heater which is used to keep the well from freezing in the winter. Control is man-made concrete ramp flume located approximately 15 feet downstream. A steel foot bridge is located 60 feet below the gage house. No changes this year.
Hydrologic Conditions.--	Drainage area above the gage is 37 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 8,100 feet at the gage from USGS topographic maps. The basin mainly consists of rock and forested mountains above the gage and changes to agricultural lands of moderate slope terrain below the gage. Small cobbles and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. The La Plata and Cherry Creek Ditch and the Pine Ridge Ditch export water above the gage for irrigation of approximately 3,000 acres.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data from the DCP with chart record for backup purposes. The gage was visited on 24 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 3 separate occasions (May 21, 2010, Aug. 4, 2010 and Sept. 17, 2010). All adjustments made were ± 0.01 feet. The record was corrected by prorating by time to the last known matched reading. One flush correction was made this water year. The flush correction occurred on Jun. 4, 2010 (+0.01 ft.). The flush corrections were prorated by time within the final record depending on the location of the inflection point on the hydrograph. A correction of -0.04 ft. was made (0800 - 1500) July 20, 2010 as a result of the removal of a small rock dam that had been placed above the control section earlier the same day. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control, floats froze in the well and when the small rock dam affected the stage-discharge relationship. Ice on the control ("b" days): Nov. 24, 25; Dec. 1-3, 7-21, 24-31, 2009; Jan. 1-13, 15, 16, 18-29, 31; Feb 1-5, 7, 11-19, 23-27; Mar. 1, 2, 6, 12, 13, 21, 2010. Floats frozen in the well: Dec. 4-6, 2009. Rock dam: Jul. 20, 2010 .
Datum Corrections.--	Levels were run this water year on Oct. 14, 2009 using RM No. 1 as base. The gage was found to be reading -0.006 feet low. No corrections were made since the ET index was found to be within the allowable error tolerances. Levels were also run to the three other reference marks (RM#2, RM#3 and RM#4). RM#2 was found to be reading -0.047 feet low. RM#2 is an anchor bolt. It was observed to be bent on Sept 22, 2009. A new elevation on the bent anchor bolt will need to be established. RM#3 was found to be reading +0.005 feet high. RM#4 was found to be reading -0.008 feet low. No corrections were made to the supplemental reference marks No. 3 and 4.
Rating.--	The control at medium and high flows is a long throated flume, hereafter referred to as a "Ramp Flume" that was constructed in August of 2000 to act as the control section for the gage. Low flows are controlled by the cobble, gravel and silt between the ramp flume and inlets. The ramp flume is located about 15 feet below the inlets to the gage. A concrete ledge with an eight-inch "I" beam, located about 60 feet below the station, acts as a limit for scour but does not act as a control section. A large boulder weir was constructed on Mar. 16-17, 2009 between the "I" beam and ramp flume to further limit scour below the ramp flume. The boulder weir has no impact on the rating of the ramp flume. Flows are contained within a single channel up to a gage height of 5.8 feet. Flows above a gage height of 5.8 feet will overbank on the right side only. The left bank is contained by the small mesa that is over 15-feet above the flow line of the channel. Rating No. 38 in use since Oct. 1, 2008 was used the entire water year. The rating is well-defined to 560 cfs. Nineteen discharge measurements (Nos. 1445-1463) were made this year, ranging in discharge from 4.80 to 183 cfs. They cover the range in stage experienced except for the lower daily flows of Dec. 9-31, 2009; Jan. 1-31; Feb 1-28; Mar. 1-8, 10-13, 2010 and the higher daily flow of May 10, 18, 21-23, 28-30; Jun. 5, 6, 2010. The peak instantaneous flow of 295 cfs occurred at 0100 May 22, 2010 at a gage height of 4.64 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 1454, made May 21, 2010 by 0.27 feet in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts as defined by measurement Nos. 1445 to 1450, were distributed by time from 1600 Sep. 23, 2009 until 1226 Mar. 17, 2010. Variable shift curve LAPHEVS10A as defined by measurements No. 1450 to 1459 was distributed by stage from 1300 Mar. 17, 2010 to 0800 Jul. 20, 2010. On Jul. 20, 2010 at approximately 0800 a small rock dam was placed approximately 5 ft. above the control. The cobbles and gravel within the channel were used to make the dam. The dam affected the stage-discharge relationship and was removed at 1528 on the same day. Measurement No. 1459 was made after the rock dam was removed and shift was applied during the period when the dam was in place. Measurement Nos. 1459 to 1463 defines the shift curve LAPHEVS10B after the rock dam was removed. Variable shift curve B was applied from 1600 on Jul. 20, 2010 until the end of the water year. A preliminary rating No. 39 has been developed to account for the change to the control conditions after the rock dam was removed but has not been implemented. More measurements are needed to define the upper end of rating No. 39 before it will be implemented. Open-water measurements showed shifts varying between -0.02 and +0.05 feet. Shifts were applied directly and given full weight except measurement Nos. 1445, 1451, 1453, 1454, 1455 and 1462 which were discounted from -5% to +4% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records, partial days of good record and four discharge measurement Nos. 1447, 1448, 1449 and 1450. The chart hydrograph was also used to determine periods of ice-affected record.

Remarks--

Record good, except for the period from Nov. 24, 25; Dec. 1-3, 7-21, 24-31, 2009; Jan. 1-13, 15, 16, 18-29, 31; Feb 1-5, 7, 11-19, 23-27; Mar. 1, 2, 6, 12, 13, 21, 2010, in which ice affected the stage-discharge relationship and Dec. 4-6, 2009 when the floats were frozen in the well. Record during this period should be considered poor. Record on Jul. 20, 2010 was affected by the rock dam and should be considered fair. Station maintained and record developed by Brian Boughton.

Recommendations--

Currently, the top of the sill of the shelter door is at a gage height of 5.80-ft. Although high flow events above a gage height of 5.80-ft are rare, they occur, and may warrant the installation of a crest gage. The large boulder weir that was installed stabilized the control but made the high water measurement section poor. A bank operated cableway may need to be installed in the weir pool above the gage to provide more reliable high water measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09365500 LA PLATA RIVER AT HESPERUS

RATING TABLE--

LAPHESCO38 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

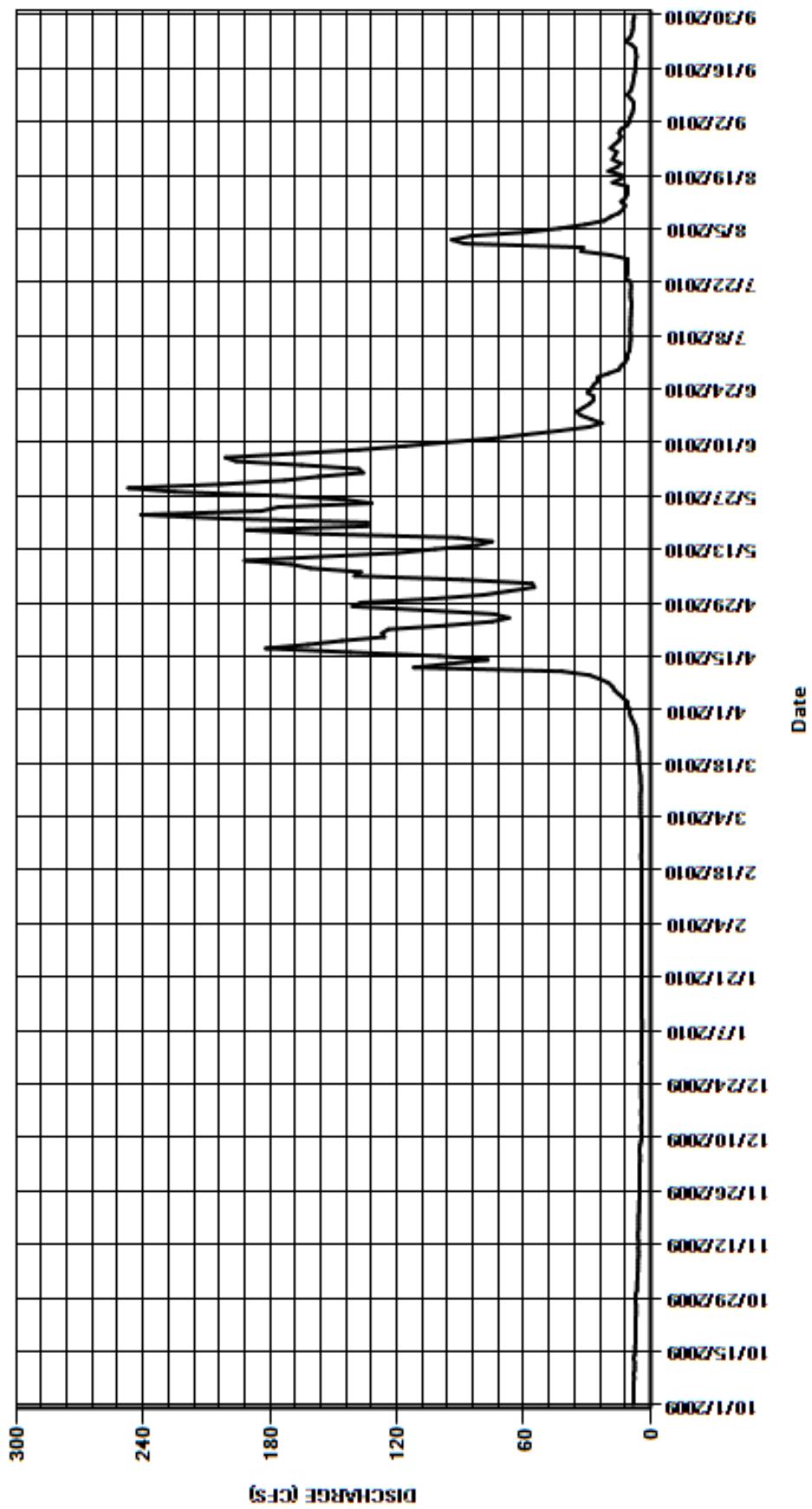
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.3	6.4	e5.2	e4.2	e4.2	e4.3	9.8	79	157	12	88	11
2	8	6.4	e5.2	e4.3	e4.2	e4.3	11	67	136	11	94	10
3	8.2	6.2	e5.2	e4.2	e4.2	4.3	11	55	138	11	85	9.7
4	8.1	6.2	e5	e4.2	e4.2	4.7	13	56	165	10	59	8.8
5	8.2	6	e5	e4.3	e4.2	4.7	15	89	196	9.8	43	8.3
6	8	6	e5.2	e4.3	4.3	e4.7	17	140	201	9.7	31	8
7	8	5.9	e5.2	e4.2	e4.3	4.7	18	137	169	9.4	22	8
8	7.8	5.9	e5	e4.1	4.4	4.7	20	161	138	9.5	19	9.5
9	8.1	5.7	e4.5	e4.1	4.3	4.9	24	170	116	9.6	15	11
10	7.6	5.7	e4.3	e4.2	4.4	4.7	29	192	96	9.6	13	9.5
11	7.6	5.9	e4.3	e4.2	e4.3	4.6	42	156	74	9.5	12	8.8
12	7.5	5.6	e4.5	e4.2	e4.3	e4.6	112	120	59	9.5	14	8.5
13	8.1	5.8	e4.5	e4.2	e4.3	e4.7	95	102	43	9.4	12	8
14	7.6	6	e4.3	4.2	e4.3	4.8	77	82	29	9.3	11	7.9
15	7.3	6	e4.3	e4.2	e4.3	4.9	100	75	23	9.2	11	7.4
16	7.4	5.7	e4.5	e4.2	e4.3	5.1	142	91	28	8.9	11	7.3
17	7.2	5.7	e4.5	4.2	e4.3	5.3	182	158	33	9.2	18	7.1
18	7.1	5.7	e4.3	e4.2	e4.3	5.6	162	191	35	9.5	14	7
19	7	5.7	e4.3	e4.2	e4.3	5.8	146	134	32	9.5	14	6.7
20	7.2	5.6	e4.4	e4.2	4.3	5.8	126	134	29	9.4	20	7
21	7.2	5.4	e4.4	e4.2	4.5	e5.8	127	202	27	9.3	16	7.1
22	7	5.4	4.5	e4.3	4.5	6.1	124	241	27	9.5	14	8.8
23	7	5.4	4.4	e4.3	e4.3	6.3	97	184	30	12	18	12
24	7	e5.3	e4.4	e4.2	e4.2	6.3	75	176	28	11	17	9.7
25	6.9	e5.2	e4.3	e4.2	e4.2	6.5	67	132	27	11	16	8.9
26	7	5.2	e4.3	e4.2	e4.2	6.7	74	145	25	11	19	8.5
27	6.9	5.2	e4.3	e4.2	e4.2	6.9	107	177	25	11	17	8.2
28	7.2	5.2	e4.3	e4.3	4.2	7.5	141	225	20	11	15	8.4
29	7	5.2	e4.4	e4.3	---	8.4	137	247	15	19	14	7.9
30	7	5.2	e4.4	4.4	---	9.3	103	203	14	33	15	7.7
31	6.4	---	e4.2	e4.3	---	9.9	---	173	---	32	14	---
TOTAL	230.9	170.8	141.6	131.0	120.0	176.9	2403.8	4494	2135	364.8	781	256.7
MEAN	7.45	5.69	4.57	4.23	4.29	5.71	80.1	145	71.2	11.8	25.2	8.56
AC-FT	458	339	281	260	238	351	4770	8910	4230	724	1550	509
MAX	8.3	6.4	5.2	4.4	4.5	9.9	182	247	201	33	94	12
MIN	6.4	5.2	4.2	4.1	4.2	4.3	9.8	55	14	8.9	11	6.7
CAL YR	2009	TOTAL	11540.5	MEAN	31.6	MAX	345	MIN	4.2	AC-FT	22890	
WTR YR	2010	TOTAL	11406.5	MEAN	31.3	MAX	247	MIN	4.1	AC-FT	22620	

MAX DISCH: 295 CFS AT 01:00 ON May. 22,2010 GH 4.64 FT. SHIFT 0 FT.

MAX GH: 4.64 FT. AT 01:00 ON May. 22,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09365500 LA PLATA RIVER AT HESPERUS
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
CHERRY CREEK AT THE MOUTH NEAR RED MESA
Water Year 2010

Location.-- Lat. 37°07'03", Long. 108°11'53", in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, T.33 N., R.12 W., NMPM, La Plata County

Drainage and Period of Record.-- 66 mi².

Equipment.-- Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42-in corrugated metal well in a concrete block shelter. The primary reference gage is a steel drop tape referenced to a nonadjustable reference point (RP) on the wooden instrument shelf.

Hydrologic Conditions.-- The channel bottom is composed of cobble and gravel. Dense willows line the channel banks. At higher flows the dense willows impact the stage discharge relationship. The creek is ephemeral and only flows during the spring snow melt, significant rain storms and irrigation returns from LaPlata and Cherry Creek Ditch.

Gage-Height Record.-- The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 11 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted (-0.01 ft.) on April 6, 2010 to match the primary reference. Shaft encoder corrections were prorated by time back to the last site visit when the readings matched. Two flush corrections were made this water year. The flush corrections occurred on Apr. 20 (+0.58 ft.) and May 14, 2010 (+0.02 ft.). The flush corrections were prorated by time within the final record depending on the location of the inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage-discharge relationship was affected by ice, the shaft encoder tape got stuck on the instrument shelf and the control was submerged. Ice on the control ("b" days): Feb. 17-28; Mar. 1-12, 2010. Heavy snow pushed the willows in to the channel causing them to collect debris and trash ("c" days) : Mar. 31; Apr. 1-3, 5-30; May 1-14, 2010. Shaft encoder tape hung up on instrument shelf ("a" days): Apr. 21, 22, 2010 .

Datum Corrections.-- Levels have never been run at this gage. No levels were run this year.

Rating.-- The control at low flows is an natural cobble riffle located 5-ft. below the gage. Dense willows along the right and left bank control at high flow. Willow growth causes the shifts to vary at high flows. Sand, silt fill and scour cause shifts as well. Rating No. 3A, dated Oct. 1, 2006, was used the entire water year. Rating No. 3A is the same as rating No. 3 (dated Oct. 1, 2004) from a gage height 1.14 to 3.11 ft. Rating No. 3A (dated Oct. 1, 2006) was developed to define the stage-discharge relationship from a gage height of 3.11 to 6.01 ft. (113 cfs to 290 cfs). It is fairly well defined from 2.4 to 107 cfs. Seven measurements (Nos. 82-88) were made during the current water year ranging in discharge from 5.18 to 78.8 cfs. An observation of zero flow was made on November 6, 2009. Observations of zero flow cover the lower range of stage experienced. The measurements cover the higher range in stage experienced except for the higher average daily flows of Apr. 18-20, 22, 2010. The peak flow of 92.7 cfs, estimated from the mass balance of other gages on the system, occurred at 1030 on April 18, 2010, at a gage height of 4.38 ft., exceeded the measurement made April 20, 2010 by 1.13 ft in stage.

Discharge.-- Shifting control method was used for the entire water year. Shifts were affected by willows, trash, leaf debris and the movement of sediment. Shifts were applied as defined by measurements and were distributed by time and stage. From Oct. 1 – Feb. 16, 2010, there was no flow. From Feb. 16, 2010 – Aug. 3, 2010, variable stage shift curve CHEREDVS10A was used. The curve is well defined below a gage height of 1.61 ft. Bending willows caused by the heavy snow from the winter exacerbated the affect the willow have on the stage-discharge relationship. The unstable rating was noticed when the gage heights exceeded 1.61 ft. From Mar. 31 to Apr. 3 and Apr. 5 to Apr. 20, 2010 the rating is very unstable as the bent willows have not begun to grow. Measurement 82 and 83 were made during this period but were only used as guides. From Apr. 20 to May 14, 2010 the willows begin to grow allowing for a more stable stage-discharge relationship but still affected by debris and remaining bent willows. A mass balance calculation was used to estimate the flows when the gage height exceeded 1.61 ft. After May 14, 2010 gage heights below 2.00 are better defined by the variable shift curve and measurements 84, 85 and 86. From Aug. 3, 2010 – Sep. 30, 2010, variable stage shift curve CHEREDVS10B as defined by measurement nos. 86, 87, 88 and 89 was used. Open-water measurements showed shifts varying between -0.59 and +0.06 feet. Shifts were applied directly and given full weight except Measurement No. 85 and 88 which were discounted to smooth shift distribution by 4% and 3% respectively. Trash and drooping willows were observed during measurement No. 82 and 83.

Special Computations.-- A partial record of the administrative gage on the La Plata River below Cherry Creek was developed and compared to the flows at the Cherry Creek gage. The control at the La Plata River gage is a concrete ramp flume that was installed in 2002. The gage provides a stable control and has minimal impact from ice during the winter months. The rating is well defined rating from 0 to 200 cfs. It is located approximately 1,200 ft. below the confluence of Cherry Creek and the La Plata River. The LaPlata record was developed for period February through September, 2010 and was used to estimate flows at the Cherry Creek gage. A mass balance approach was used to calculate the flows when the control at the Cherry Creek gage was submerged. A spread sheet was provided to show the calculations. The traditional approach to calculate the peak stream flow at the Cherry Creek gage was determined to provide unreasonable results. At a gage height of 4.38 ft. and a shift of -0.52 (shift at highest discharge measurement) the peak discharge would be 154 cfs. The flow at the LaPlata River below Cherry Creek (located 1,200 ft. below the gage) was 184 cfs at the same time. The flow at the LaPlata River at Breen (concrete ramp flume) was 103 cfs (taking into account travel time). With very few diversions on the LaPlata River from Breen to Cherry Creek, it was assumed there was more than 30 cfs in the LaPlata River above the confluence of Cherry Creek. Therefore the peak discharge was estimated using a mass balance approach but should be considered a poor estimate. A hydrograph was used to compare the final results.

Remarks--

Record is excellent from October 1, 2009 to February 15, 2010. Record is fair from March 13 to March 30 and May 15 to September 30, 2010. The record is poor from February 16 to March 12 when ice on the control affected the stage-discharge relationship. The record is poor from March 31 to May 14 when the control was submerged. The instantaneous peak flow should be considered poor as well. Station maintained and record developed by Brian Boughton.

Recommendations--

Levels need to be run and benchmarks should be established in Water Year 2011. More measurements need to be made at key times in order to better define the changes in the control throughout the water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CHERRY CREEK AT THE MOUTH NEAR RED MESA

RATING TABLE--

CHEREDCO03A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	e0.2	e18	e32	4.7	5.3	16	6.5
2	0	0	0	0	0	e0.3	e12	e24	4.4	6.5	23	5.6
3	0	0	0	0	0	e0.5	e9.8	e20	5.2	8.3	26	4.9
4	0	0	0	0	0	e1	7.8	e16	5.7	8.3	26	4.4
5	0	0	0	0	0	e1	e12	e17	6.5	7.5	18	3.9
6	0	0	0	0	0	e1	e20	e19	6.6	6.9	13	3.1
7	0	0	0	0	0	e1	e16	e22	6.7	6.2	12	2.6
8	0	0	0	0	0	e1	e20	e27	6.5	5.6	14	2.8
9	0	0	0	0	0	e2	e30	e32	5.2	5.4	13	6.1
10	0	0	0	0	0	e2	e36	e41	5.7	5.1	15	5.3
11	0	0	0	0	0	e2.5	e35	e29	6.7	4.1	14	4
12	0	0	0	0	0	e2.5	e49	e30	6.9	3.1	14	3.1
13	0	0	0	0	0	3.3	e58	e24	8.2	2.4	14	2.6
14	0	0	0	0	0	2.7	e29	e21	5.6	1.9	12	2
15	0	0	0	0	0	2.3	e39	19	4.7	1.5	9.9	1.5
16	0	0	0	0	0	2.1	e45	17	6.1	1.1	8.6	1.2
17	0	0	0	0	0	2.6	e64	18	7.5	0.94	8.4	0.93
18	0	0	0	0	e0.05	3.6	e84	19	5.9	0.83	9.6	0.84
19	0	0	0	0	e0.05	5.1	e79	20	4.5	0.25	8.1	0.74
20	0	0	0	0	e0.1	4.7	e81	15	3.8	0.02	10	0.64
21	0	0	0	0	e0.1	4.5	e75	12	3	0	11	0.77
22	0	0	0	0	e0.05	4.2	e80	13	2.9	0.03	8.7	0.89
23	0	0	0	0	e0.05	4.7	e76	14	2.6	0	8.4	3.2
24	0	0	0	0	e0.05	6.2	e50	11	1.9	0	10	5.8
25	0	0	0	0	e0.05	5.6	e37	8.2	1.2	0	9.1	3.7
26	0	0	0	0	e0.05	6.3	e33	6.1	1.1	0.97	7.6	2.7
27	0	0	0	0	e0.1	5.9	e32	3.9	0.92	3	7.9	2
28	0	0	0	0	e0.1	5.8	e36	4.3	0.9	6.3	7	1.5
29	0	0	0	0	---	6.2	e46	5.4	0.88	6.6	6.2	0.98
30	0	0	0	0	---	8	e43	4.4	3.7	7.4	6.2	0.9
31	0	---	0	0	---	e17	---	5	---	12	7.9	---
TOTAL	0.00	0.00	0.00	0.00	0.75	115.80	1252.6	549.3	136.20	117.54	374.6	85.19
MEAN	0	0	0	0	0.027	3.74	41.8	17.7	4.54	3.79	12.1	2.84
AC-FT	0	0	0	0	1.5	230	2480	1090	270	233	743	169
MAX	0	0	0	0	0.1	17	84	41	8.2	12	26	6.5
MIN	0	0	0	0	0	0.2	7.8	3.9	0.88	0	6.2	0.64

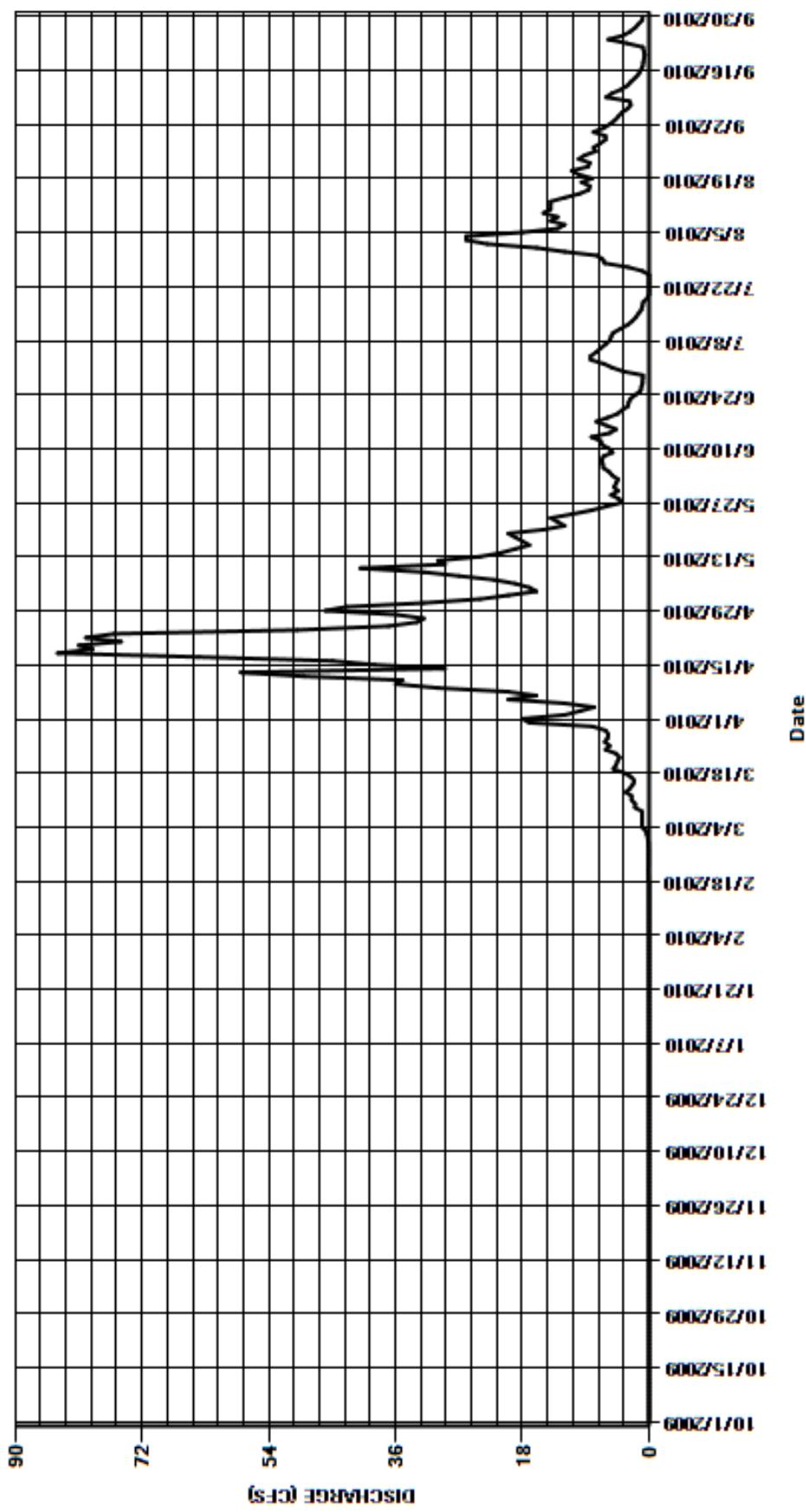
CAL YR	2009	TOTAL	1721.94	MEAN	4.72	MAX	48	MIN	0	AC-FT	3420
WTR YR	2010	TOTAL	2631.98	MEAN	7.21	MAX	84	MIN	0	AC-FT	5220

MAX DISCH: 92.7 CFS AT 10:30 ON Apr. 18,2010 GH 4.38 FT. (Estimated from mass balance)

MAX GH: 4.38 FT. AT 10:30 ON Apr. 18,2010 (Backwater from willows in channel)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHERRY CREEK AT THE MOUTH NEAR RED MESA
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
LONG HOLLOW AT THE MOUTH NEAR RED MESA
Water Year 2010

Location.--	Lat. 37°03'02", Long. 108°10'23", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, T.33 N., R.12 W., NMPM, La Plata County.
Drainage and Period of Record.--	46.5 mi ² . October 1988 to present.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 satellite monitoring DCP and shaft encoder on separate floats in a wooden shelter and well at a 4-foot steel Parshall flume. Primary reference gage is outside staff gage installed in flume. An insulated floor is installed in the stilling well when the temperatures fall below freezing. The floor was installed on Dec. 16, 2009 and removed on Mar. 17, 2010. No other changes.
Hydrologic Conditions.--	The drainage area above the gage is 46.5 square miles. The creek above and below the control is mainly silt with some sand and gravel. The approach conditions into the flume are fair to poor. The stilling pool above the flume is poor. Excessive approach velocities tend to cause a positive shift to a standard Parshall flume rating. The creek base flow is from irrigation return flows and will flash during rain events.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data with chart record used for backup purposes. The gage was visited on 12 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted five times this water year. Shaft encoder corrections were made on April 20, 2010 (-0.02 ft.), June 22, 2010 (+0.02 ft.), August 3, 2010 (+0.01 ft.), August 11, 2010 (+0.01 ft.) and September 17, 2010 (+0.02 ft.). Moss was removed from the control resulting in a correction two times this water year. The moss correction occurred on April 29, 2010 (-0.04 ft.) and June 22, 2010 (-0.04 ft.). The datum corrections were distributed by time to the last inspection when the flume was cleaned and the shaft encoder matched the primary reference gage. Record is complete and reliable.
Datum Corrections.--	Levels were not run this year. Levels were last run on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume is -0.07 ft. low on the intake side (right-edge-of-water). No other benchmarks were set at the time.
Rating.--	The control is a 4-foot Parshall flume installed in 1988 to monitor the return flows through Long Hollow for the Animas/La Plata Conservancy District. Horizontal dirt and grass wing walls extend in both directions above an elevation of 2.25 feet. Rating No. 1A, in use since October 1, 2007, is a standard 4- foot Parshall flume rating from gage height 0 to 2.25. Gage heights above 2.25 ft. flow in the natural channel. A theoretical rating was developed above a gage of 2.25 ft as no measurements have been made above this stage. The rating was used the entire year. It is well defined from 1.44 to 29 cfs. Two measurements were made during the current water year ranging in discharge from 5.79 to 9.59 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 1-31; Nov. 1-30; Dec. 1-31, 2009; Jan. 1-21, 24-27, 30, 31; Feb. 1-7, 9-20, 23-28; May 15-31; Jun. 1-30; Jul. 1-29, 31; Aug. 1, 3-31; Sep. 1-30, 2010 and the higher average daily flow of Mar. 8; Apr. 6-11, 13, 14, 18, 19, 22, 23, 2010. The peak instantaneous flow of 50.1 cfs occurred at 1515 Jul. 30, 2010 at a gage height of 1.94 ft (gage height correction of +0.01 ft applied) with a shift of +0.12 ft. It exceeded the stage of measurement No. 212, made Mar. 17, 2010 by 1.33 ft. in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is mainly caused by moss growth in the flume and excessive silt in the approach section of the flume. Shifting is also caused by the unlevel Parshall flume. Measurements show shifts varying from +0.05 to +0.11 feet. Shifts were applied directly and given full weight except for measurement No. 212 which was discounted by +8% to smooth shift distribution. Shifts were distributed by stage for the entire water year. Shifts were distributed using variable shift table LONREDVS10A from 0000 Oct. 1, 2009 to the end of the water year. Positive shifts define the variable shift curve and are caused by silt building in the stilling pool above the flume increasing the velocity in the approach section.
Special Computations.--	The peak flow was compared with the peak flow of the downstream gage at the La Plata River at Colorado/New Mexico Stateline (DWR published record). The peak flow at the Stateline gage was 55.7 cfs at 1745 on July 30, 2010. The stateline gage is located on the LaPlata River approximately 3.5 miles below the confluence of Long Hollow and LaPlata River. Flows on the LaPlata River above the confluence were considered and remained fairly constant before the rain event. Flows at the LaPlata River below the Mouth of Cherry Creek gage (LAPCHECO admin gage w/ concrete ramp flume) were estimated to be 6 cfs.
Remarks.--	Record is fair. The peak flow is considered fair since a discharge measurement has not been made above a gage height of 1.33 ft. Station maintained and record developed by Brian Boughton.
Recommendations.--	Levels should be run in Water Year 2011.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LONG HOLLOW AT THE MOUTH NEAR RED MESA

RATING TABLE--

LONREDCO01A USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

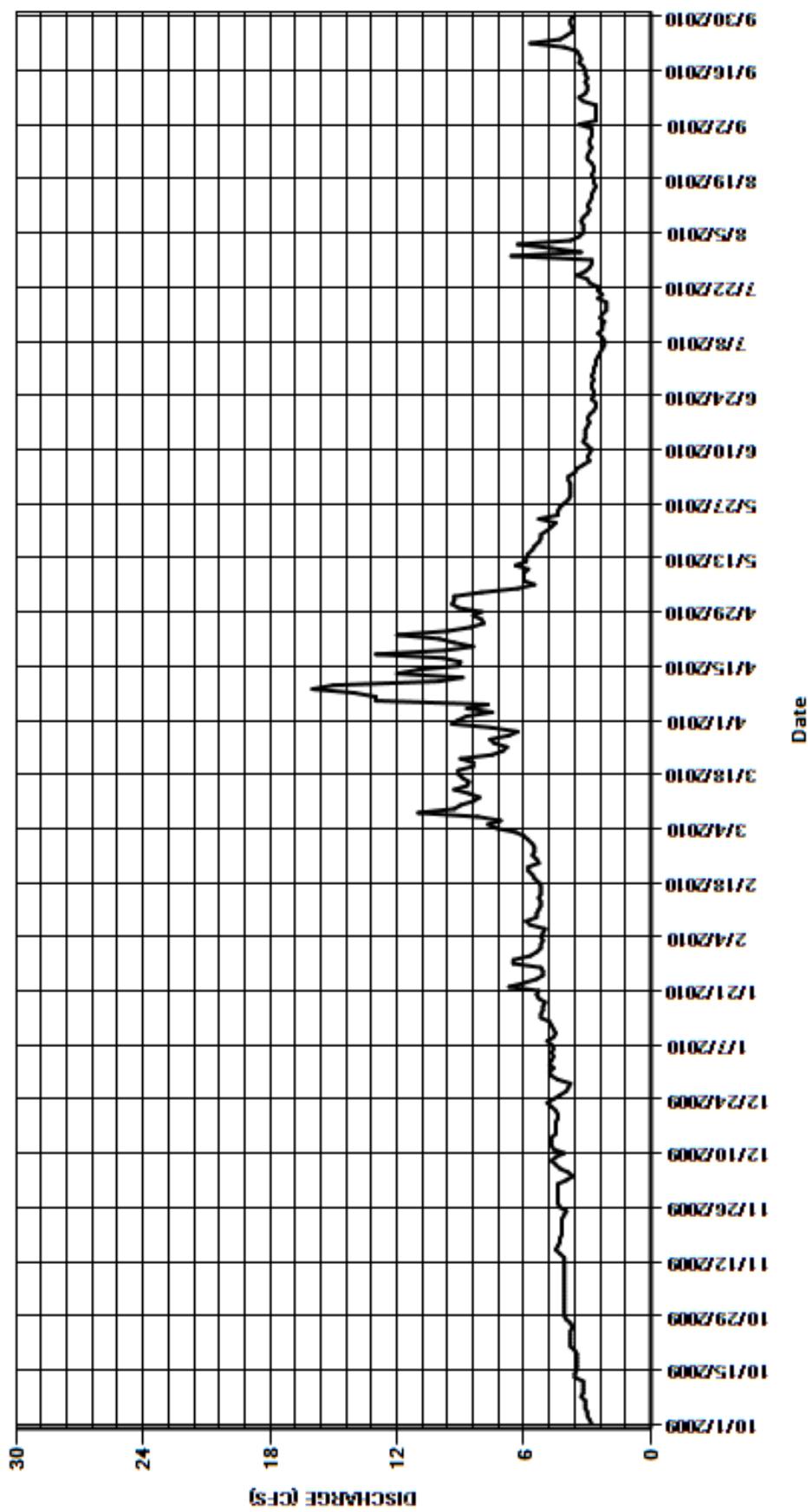
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	4.1	4.4	4.6	5.2	5.8	9.1	9.4	3.8	2.7	4.7	2.8
2	2.9	4.1	4.4	4.8	5.2	6	8.7	9.3	3.9	2.6	6.3	3.4
3	3	4.1	4	4.7	5.1	6.4	7.5	9.3	3.9	2.6	3.8	2.6
4	3	4.1	3.7	4.6	5.2	7.3	8.7	8	3.6	2.5	3.4	2.6
5	3.1	4.1	3.9	4.7	5.1	7.7	7.7	6.3	3.5	2.4	3.2	2.6
6	3.1	4.1	4.3	4.6	5	7.1	13	5.5	3.2	2.3	3.2	2.6
7	3.1	4.1	4.5	4.7	5.7	8.2	13	6	2.9	2.2	3.2	2.6
8	3.3	4.1	4.7	4.9	5.9	11	14	6	3	2.2	3.3	3.2
9	3.2	4.1	4.5	4.6	5.4	9.3	16	6	2.9	2.3	3.2	3.4
10	3.2	4.1	4.1	4.5	5.4	9	15	5.8	2.8	2.5	3	3.1
11	3.2	4.1	4.6	4.6	5.3	8.4	10	6.4	3	2.3	2.9	3
12	3.2	4.1	4.7	4.7	5.2	8.1	8.9	5.9	3.2	2.3	3	3
13	3.6	4.1	4.7	4.8	5.2	8.6	12	5.9	3.1	2.2	2.9	3.1
14	3.6	4.3	4.7	5.2	5.3	9.3	11	5.8	3.1	2.4	2.8	3
15	3.5	4.5	4.5	5.2	5.2	8.7	9.1	5.6	3.1	2.3	2.8	3.1
16	3.5	4.4	4.5	5.1	5.2	8.6	9	5.5	3	2.1	2.7	3.1
17	3.5	4.3	4.5	5.1	5.2	8.9	9.8	5.3	2.9	2.1	2.6	3.2
18	3.5	4.3	4.5	5	5.3	9.1	13	5.2	3	2.1	2.7	3.4
19	3.5	4.2	4.4	5.3	5.5	9.1	9.7	5.2	2.9	2.5	2.7	3.3
20	3.6	4.2	4.4	5.4	5.6	8.4	8.4	4.9	2.7	2.3	2.8	3.4
21	3.8	4.2	4.5	5.3	5.8	8.4	9.3	4.7	2.6	2.5	2.7	3.5
22	3.8	4.2	4.7	6.7	5.8	9	10	4.5	2.6	2.5	2.7	4.1
23	3.8	4.2	4.9	6	5.3	7.5	12	5.3	2.8	2.9	2.8	5.7
24	3.8	4.1	4.6	5.4	5.4	7	9.6	4.4	2.7	3	3	4.3
25	3.8	4	4.3	5.1	5.6	6.8	8.5	4.4	2.7	3.5	3	4
26	3.7	4.3	4	5.1	5.5	7.4	7.9	4.3	2.8	3.1	2.9	3.7
27	3.8	4.4	3.9	5.2	5.5	7.6	8	4.1	2.8	2.9	2.8	3.7
28	4	4.4	3.8	6.5	5.6	6.7	8.4	3.9	2.7	2.8	2.9	3.8
29	4.1	4.4	4.4	6.5	---	6.3	8	3.8	2.8	2.8	2.9	3.8
30	4.1	4.4	4.7	5.7	---	7.5	9.1	3.8	2.7	6.6	2.8	3.7
31	4.1	---	4.8	5.4	---	9.4	---	3.8	---	3.3	2.8	---
TOTAL	108.2	126.1	136.6	160.0	150.7	248.6	304.4	174.3	90.7	82.8	96.5	100.8
MEAN	3.49	4.2	4.41	5.16	5.38	8.02	10.1	5.62	3.02	2.67	3.11	3.36
AC-FT	215	250	271	317	299	493	604	346	180	164	191	200
MAX	4.1	4.5	4.9	6.7	5.9	11	16	9.4	3.9	6.6	6.3	5.7
MIN	2.8	4	3.7	4.5	5	5.8	7.5	3.8	2.6	2.1	2.6	2.6

CAL YR	2009	TOTAL	1537.6	MEAN	4.21	MAX	7.1	MIN	1.6	AC-FT	3050
WTR YR	2010	TOTAL	1779.7	MEAN	4.88	MAX	16	MIN	2.1	AC-FT	3530

MAX DISCH: 50.1 CFS AT 15:15 ON Jul. 30,2010 GH 1.94 FT. SHIFT 0.12 FT. (GH CORR. +0.01 FT. APPLIED)
 MAX GH: 1.94 FT. AT 15:15 ON Jul. 30,2010 (GH CORR. +0.01 FT. APPLIED)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONGHOLLOWATTHEMOUTHNEARREDMESA
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2010

Location.--	Lat. 36°59'58", Long. 108°11'09", in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T.32 N., R.13 W., NMPM, La Plata County.
Drainage and Period of Record.--	N/A
Equipment.--	Sutron high data rate Satlink 2 DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and a 20-inch x 20-inch concrete well. Primary reference gage is outside staff gage (0 to 1.06-ft) installed in flume. Control is a 1-foot concrete Parshall flume. No other changes this year.
Hydrologic Conditions.--	Heavy vegetation growth upstream and downstream will cause changes in shifts from year to year. A head gate to the first ditch lateral is located approximately 25-ft below the flume. On occasion the vegetation growth downstream and operations at the head gate can submerge the Parshall flume.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP. The gage was visited on 24 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 2 times this water year (Jul. 7, 2010 and Aug. 3, 2010). The adjustment made were -0.01 and +0.02 feet respectively. The datum correction made on Aug. 3, 2010 was caused by a partially plugged intake and sediment in the stilling well. This correction was not prorated back in time as the gage height remained fairly stable and the gage still recorded several rain events between July 26 and August 3, 2010. Record is complete and reliable except for periods when a large rain event dumped silt and debris in the ditch causing the flume to submerge: October 1, 2, 4-8, 2009 . There were also periods when ice in the stilling well caused the float to heave: December 6-16, 2009; January 15-31; February 1-28; March 1-4, 2010. The large rain event on July 30 appears to partially plug the intake with sediment in the stilling well. The stilling well was cleaned on August 3, 2010.
Datum Corrections.--	Levels have never been run at this gage.
Rating.--	The control is a standard, 1-foot, concrete Parshall flume. Rating No. 01 is a standard 1-ft Parshall flume rating above a gage height of 0.12-ft. The intake to the stilling well is 0.12-ft above the floor of the flume. Flows below a gage height 0.12-ft are assumed to be negligible and a 0 flow is assigned to them. Rating No. 01 has been used since the gage was installed and was used all water year. No discharge measurements were made this water year. Five observations of zero flow were made on Nov. 6, Dec. 16, 2009, Jan. 12, Apr. 20 and Sept. 28, 2010. The peak instantaneous flow of 9.38 cfs occurred at 0115 September 23, 2010 at a gage height of 1.75 ft with a shift of 0.00 ft.
Discharge.--	Measurements are made at the staff gage in the flume and well intake. No discharge measurements were made this water year. The discharge record was computed by direct application of the rating to the gage height record.
Special Computations.--	- No special computations were necessary this water year
Remarks.--	Record fair except for the period October 1, 2, 4-8, 2009 when the flume was submerged and March 1-4, 2010 when the stage-discharge relationship was affected by ice. Record during this period should be considered poor. Station maintained and record developed by Brian Boughton.
Recommendations.--	Currently the bottom of the well is level with the bottom of the intake. Mud and silt can build up enough and not allow the float to settle to the bottom. The existing stilling well should be removed and a deeper one installed or the bottom of the existing well should be removed and excavated deeper.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

PIODITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e0.05	0	0	0	0	e0.05	0	3.2	4.1	1.6	0.27	0.54
2	e0	0	0	0	0	e0.05	0	3.1	3.9	1.6	0.26	0.49
3	0	0	0	0	0	e0.1	0	3.1	3.9	1.6	0.18	0.39
4	e0.03	0	0	0	0	e0.15	0	3	4	1.5	0.07	0.35
5	e0.21	0	0	0	0	0.03	0	3	3.8	1.5	0	0.3
6	e0.23	0	0	0	0	0	0	3.2	3.9	1.4	0	0.25
7	e0.24	0	0	0	0	0.07	0	3.7	3.9	1.2	0	0.2
8	e0.23	0	0	0	0	0.04	0	4.3	4	1.3	0	0.39
9	0.24	0	0	0	0	0	0	4.4	3.9	1.2	0	0.51
10	0.23	0	0	0	0	0	0	4.6	3.9	1.2	0	0.5
11	0.25	0	0	0	0	0	0	4.8	3.7	2	0	0.35
12	0.25	0	0	0	0	0	0	4.8	3.6	2.3	0.36	0.31
13	0.29	0	0	0	0	0	0	4.8	3.5	2	0	0.26
14	0.27	0	0	0	0	0	0	4.6	3.3	1.5	0	0.21
15	0.25	0	0	0	0	0	0	4.3	3.3	1.4	0	0.19
16	0.24	0	0	0	0	0	0	4.2	3.2	1	0	0.12
17	0.24	0	0	0	0	0	0	4.3	3.2	0.18	0	0
18	0.19	0	0	0	0	0	0	4.4	3.3	0.03	0.39	0.03
19	0.08	0	0	0	0	0	0	4.2	3.3	0	0.88	0.06
20	0.07	0	0	0	0	0	0	4.2	3.1	0	0.86	0.15
21	0.18	0	0	0	0	0	0	4	2.9	0	1	0.09
22	0.01	0	0	0	0	0	0	4	2.7	0	0.93	0
23	0	0	0	0	0	0	0.68	3.9	2.6	0.03	0.87	0.57
24	0	0	0	0	0	0	2.7	4	2.7	0.14	0.79	0
25	0	0	0	0	0	0	2.8	4.1	2.4	0.06	0.9	0
26	0	0	0	0	0	0	2.7	3.9	1.9	0	0.7	0
27	0	0	0	0	0	0	3	3.9	1.6	0	0.65	0
28	0	0	0	0	0	0	3.1	4.1	1.8	0.04	0.61	0
29	0	0	0	0	---	0	3.2	4.2	1.8	0.02	0.58	0
30	0	0	0	0	---	0	3.3	3.9	1.7	0.39	0.52	0
31	0	---	0	0	---	0	---	4	---	0.22	0.55	---
TOTAL	3.78	0.00	0.00	0.00	0.00	0.49	21.48	124.2	94.9	25.41	11.37	6.26
MEAN	0.12	0	0	0	0	0.016	0.72	4.01	3.16	0.82	0.37	0.21
AC-FT	7.5	0	0	0	0	1	43	246	188	50	23	12
MAX	0.29	0	0	0	0	0.15	3.3	4.8	4.1	2.3	1	0.57
MIN	0	0	0	0	0	0	0	3	1.6	0	0	0

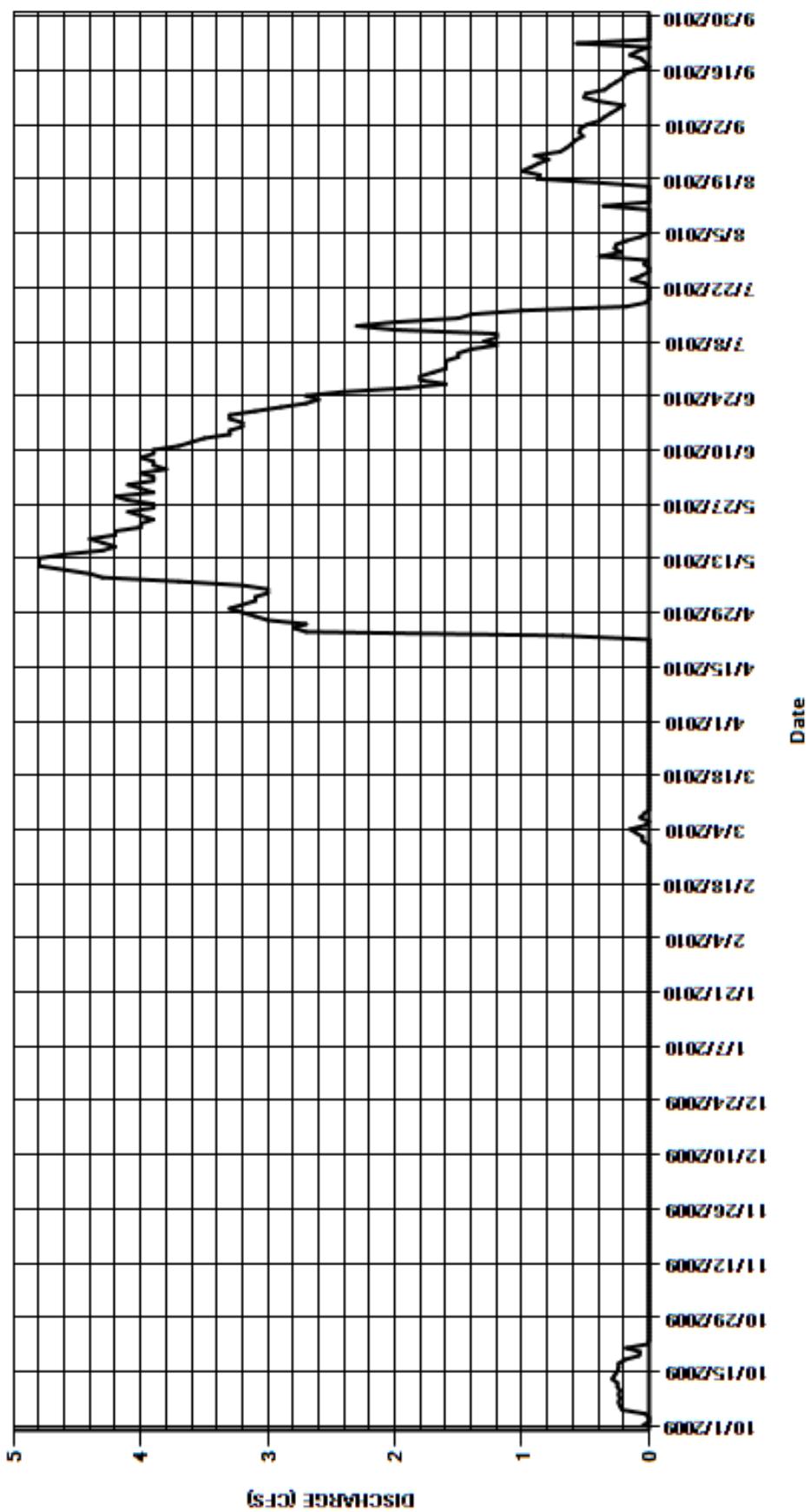
CAL YR	2009	TOTAL	307.61	MEAN	0.84	MAX	5.5	MIN	0	AC-FT	610
WTR YR	2010	TOTAL	287.89	MEAN	0.79	MAX	4.8	MIN	0	AC-FT	571

MAX DISCH: 9.38 CFS AT 01:15 ON Sep. 23,2010 GH 1.75 FT. SHIFT 0 FT.

MAX GH: 1.75 FT. AT 01:15 ON Sep. 23,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2010

Location.--	Lat. 37°00'50", Long. 108°11'18", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T.32 N., R.13 W., NMPM, La Plata County.
Drainage and Period of Record.--	N/A
Equipment.--	Sutron Satlink 2 high data rate DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and well. Primary reference gage is an outside staff gage installed in flume. Control is a 2-foot concrete Parshall flume. No changes this year.
Hydrologic Conditions.--	The ditch above and below the control is silt with a very well defined stilling pool above the flume. The approach conditions into the flume are good but can degrade if willow growth along the ditch is not maintained. The last time ditch maintenance occurred near the flume was between May 4th and 10th 2006. Silt can deposit in the stilling pool above the flume causing the velocity to increase. Vegetative growth downstream can slow the water and submerge the flume if the ditch is not maintained.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data with no backup data. The gage was visited on 24 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted twice this water year. Shaft encoder corrections were made on April 20, 2010 (-0.02 ft) and June 21, 2010 (+0.01 ft). The April datum correction began on April 9th when the well began to thaw. It was assumed this correction was caused when the floats were removed from the ice in the well on January 12 but were not properly reset. The shaft encoder could not be adjusted until water was flowing in the ditch. The June datum correction was distributed by time to the last inspection when the shaft encoder matched the primary reference. Record is complete and reliable except for the following periods when ice in the stilling well caused the float to heave: Nov. 14-17; Dec. 6-31, 2009; Jan. 1-14, 2010 . Verification of the floats in ice was confirmed at a site visit on Jan. 12, 2010: . Ice heave on the float:
Datum Corrections.--	Levels were not run this water year. Levels were last run on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume was properly set. No other benchmarks were set at the time.
Rating.--	The control is a 2 foot concrete Parshall flume. Rating No. 01 is a standard 2-ft Parshall flume rating above a gage height of 0.03 ft and was used the entire water year. The intake to the stilling well is 0.03 ft above the floor of the flume. Flows below a gage height 0.03 ft. are assumed to be negligible and a 0 flow is assigned to them. It is fairly well defined to 7.4 cfs. Four discharge measurements were made this water year. They range in discharge from 2.45 to 7.38 cfs. Nine observations of zero flow were made this water year. They occurred on Oct. 5, 2009; Jan. 12; Apr. 12; Jul. 20, 26; and Sep. 7, 13, 20, 28, 2010. Measurements and observations of 0 flow cover the range in stage. The peak instantaneous flow of 7.39 cfs occurred at 2045 May 31, 2010 at a gage height of 0.91 ft with a shift of +0.04 ft. The peak did not exceed the stage of measurement No. 28 made this water year.
Discharge.--	Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the Parshall flume. Measurements are made at the staff gage in the flume at well intake and staff gage. Shifts were applied as defined by measurements and were distributed by stage. All shifts were given full weight. Variable shift curve ENTDITCOVS10A was used for the entire period of record. Positive shifts define the variable shift curve and are caused by silt building in the stilling pool above the flume increasing the velocity in the approach section.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	Record is complete and reliable for the entire period of record. Station maintained by Matt Schmitt, Rusty Crangle and record developed by Brian Boughton.
Recommendations.--	Additional benchmarks should be established at the gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

ENTDITCO01 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	0	0	0	0	3.3	7.3	2.5	2.5	1.7
2	0	0	0	0	0	0	0	3.2	7.2	2.4	3	1.6
3	0	0	0	0	0	0	0	3.1	7.3	2.5	4.3	1.5
4	0	0	0	0	0	0	0	3	7.3	2.5	4.3	1.5
5	0	0	0	0	0	0	0	2.9	7.2	2.5	2.3	1.4
6	0.01	0	0	0	0	0	0	3.6	7.1	2.4	2.4	1.1
7	0.01	0	0	0	0	0	0	5.3	6.7	2.4	2.8	0.31
8	0.13	0	0	0	0	0	0	5.8	6.3	2.4	2.8	0
9	0.24	0	0	0	0	0	0	5.9	6.2	2.3	2.8	0
10	0.23	0	0	0	0	0	0	6.1	6.2	2.4	2.8	0
11	0.21	0	0	0	0	0	0	6.5	5	1.9	2.7	0
12	0.21	0	0	0	0	0	0	6.7	3.9	1.2	2.7	0
13	0.3	0	0	0	0	0	0	6.4	3.1	0.28	2.7	0
14	0.3	0	0	0	0	0	0	5.4	2.6	0	2.6	0
15	0.32	0	0	0	0	0	0	5.3	2.5	0	2.6	0
16	0.34	0	0	0	0	0	0	5.5	2.4	0	2.5	0
17	0.31	0	0	0	0	0	0	5.6	2.5	0	2.4	0
18	0.3	0	0	0	0	0	0	5.5	2.6	0	2.5	0
19	0.3	0	0	0	0	0	0.92	5.4	2.6	0	2.3	0
20	0.3	0	0	0	0	0	2.5	5.7	2.6	0	2.3	0
21	0.3	0	0	0	0	0	2.4	5.9	2.6	0	2.5	0
22	0.3	0	0	0	0	0	2.4	5.9	2.6	0	2.3	0
23	0.3	0	0	0	0	0	2.4	5.8	2.6	0	2.3	0
24	0.3	0	0	0	0	0	2.6	5.9	2.6	0	2.3	0
25	0.3	0	0	0	0	0	2.6	5.8	2.6	0	2.5	0
26	0.13	0	0	0	0	0	2.7	5.7	2.6	0	2.2	0
27	0.31	0	0	0	0	0	3.2	5.7	2.5	0	2.2	0
28	0.21	0	0	0	0	0	3.3	5.9	2.5	0	2.2	0
29	0.16	0	0	0	---	0	3.4	6.6	2.5	0	2.1	0
30	0.16	0	0	0	---	0	3.4	6.5	2.5	0.66	2	0
31	0.08	---	0	0	---	0	---	6.9	---	1.7	1.7	---
TOTAL	6.06	0.00	0.00	0.00	0.00	0.00	31.82	166.8	124.2	30.04	79.6	9.11
MEAN	0.2	0	0	0	0	0	1.06	5.38	4.14	0.97	2.57	0.3
AC-FT	12	0	0	0	0	0	63	331	246	60	158	18
MAX	0.34	0	0	0	0	0	3.4	6.9	7.3	2.5	4.3	1.7
MIN	0	0	0	0	0	0	0	2.9	2.4	0	1.7	0

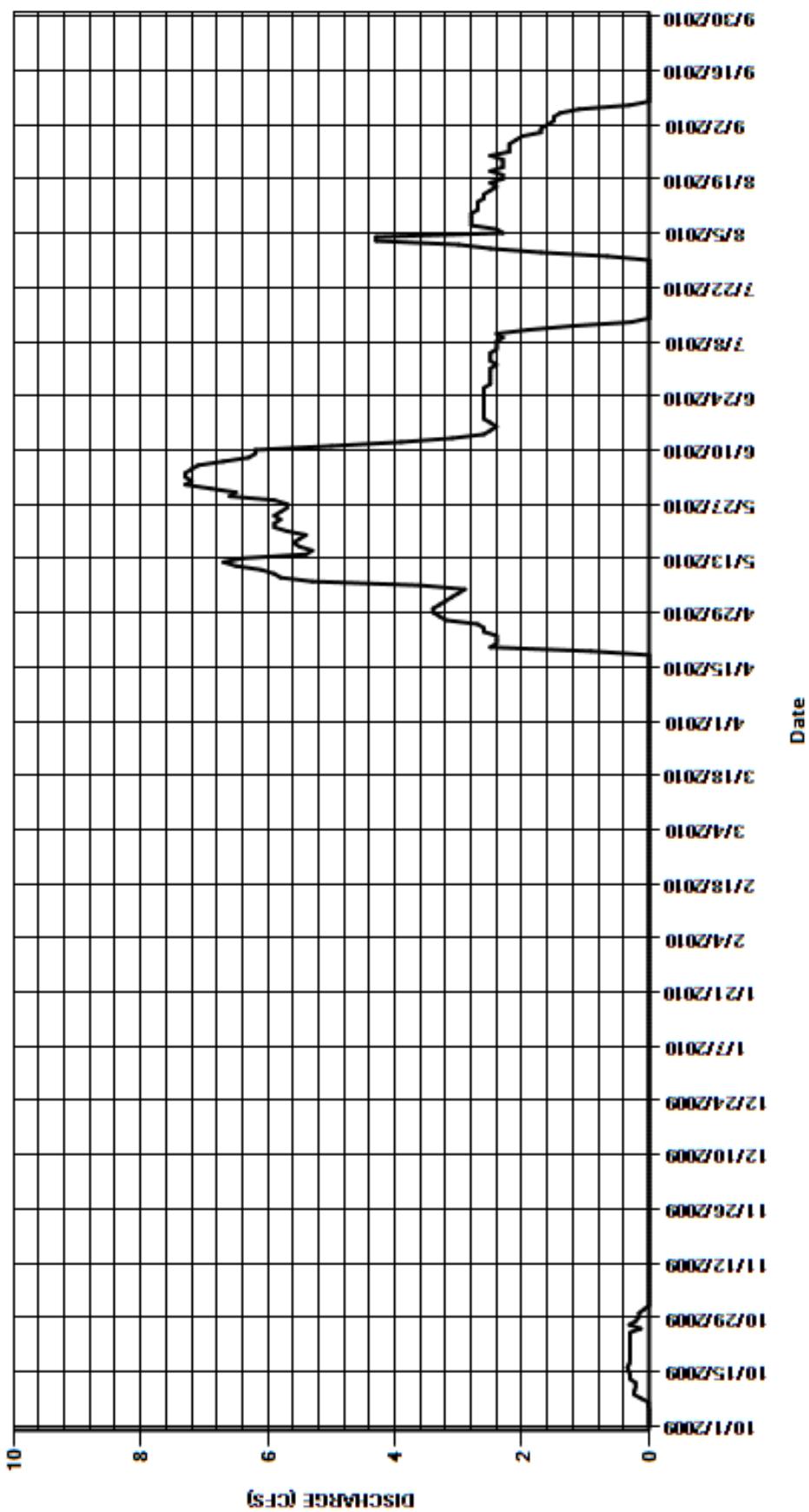
CAL YR	2009	TOTAL	422.77	MEAN	1.16	MAX	6.2	MIN	0	AC-FT	839
WTR YR	2010	TOTAL	447.63	MEAN	1.23	MAX	7.3	MIN	0	AC-FT	888

MAX DISCH: 7.39 CFS AT 20:45 ON May. 31,2010 GH 0.91 FT. SHIFT 0.04 FT.

MAX GH: 0.91 FT. AT 20:45 ON May. 31,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

Water Year 2010

Location.--	Lat. 36°59'59", Long. 108°11'17", in NW 1/4 SE 1/4 sec. 10, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on right bank at Colorado-New Mexico State line, 0.5 mi downstream of Johnny Pond Arroyo, and 4.9 mi north of La Plata, NM.
Drainage and Period of Record.--	331 mi ² . Jan. 1920 to current year. Monthly data only for some periods.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on separate floats in a 42-inch diameter CMP well and 64-inch by 64-inch cement block shelter. The floats are located inside of a 14 inch PVC oil cylinder. The primary reference gage is an electric drop tape inside the gage house. A drop tape inside the gage house is used to reference the gage when the well is frozen around the oil cylinder. The station is also equipped with an air temperature sensor. The control is a compound concrete long throated flume, hereafter referred to as a "ramp flume". A foot bridge located 6- feet below the gage house is used for access and to make high flow measurements.
Hydrologic Conditions.--	The drainage area above the gage is 331 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 5,972 feet at the gage. The gage is located at the Colorado-New Mexico Stateline. The basin mainly consists of rock and forested mountains to an elevation of 8,000 feet (Hesperus) and changes to agricultural from Hesperus to the Stateline. Silt and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. Many diversions for irrigation occur above this gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record for backup purposes. The gage was visited on 40 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 3 times this water year (Mar. 17, 2010, Apr. 20, 2010 and Sept. 17, 2010). The adjustment made were +0.01, -0.01 and +0.01 feet respectively. The shaft encoder was also adjusted, -0.01 ft, on Oct. 1, 2010 and was distributed into the 2010 record. A correction of -0.02 feet was made October 8, 2009 as a result of leaves that had accumulated in the control section and were removed. Four flush corrections were made this water year. The flush corrections occurred on Oct. 5, 2009 (+0.02 ft), Apr. 20, 2010 (+0.03 ft), Jun. 4, 2010 (+0.03 ft) and Sept. 17, 2010 (+0.01 ft). The flush corrections were prorated by time within the final record back to the time of last inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 25-28; Dec. 2-31, 2009; Jan. 1-31; Feb. 1-10, 23, 24, 2010 .
Datum Corrections.--	Levels were not run this water year. Levels were last run on September 22, 2009 to the electric tape index (ET index) using RM #3 as the base. The ET index was found to be reading -0.002 feet low. No corrections were made since the ET index was found to be within the allowable error tolerances. Levels were also run to the two other reference marks (RM#4 and RM#5). RM#4 was found to be reading +0.006 feet high and RM#5 was found to be reading +0.014 feet high. No corrections were made to the supplemental reference marks.
Rating.--	The ramp flume contains three definitive flow control zones. The low flow zone looks like a concrete broad-crested Cipolletti weir, ranges in stage from 2.80 ft. to 3.30 ft. (or 0 cfs to approximately 1.16 cfs). The middle zone is concrete and ranges in stage from 3.30 ft. to 5.37 ft. or 1.16 cfs to 320 cfs. At higher flows (GH = 5.37 ft. to 8.40 ft.) channel will overbank on the left side into a natural section lined with grass, trees and willows. The control section is located about 14 feet below the inlets to the gage. The point-of-zero-flow (PZF) is approximately 2.80 ft. The PZF was not verified this water year. Twenty one measurements (No. 1392-1412) were made during the water year. They range in discharge from 1.53 to 145 cfs. They cover the range in stage experienced except for the lower daily flows of Jul. 15, 16, 18-20, 2010 and the higher daily flows of Apr. 17-19, 2010. Rating table No. 33 was developed on Oct. 1, 2008 and was used the entire water year. It is fairly well defined from 0.20 to 572 cfs. The upper end of the rating table (above 1200 cfs) is based on the poor measurement made Sept. 9, 2003. The peak instantaneous flow of 212 cfs occurred at 1800 Apr. 18, 2010 at a gage height of 4.95 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 1400, made Apr. 20, 2010 by 0.32 feet in stage. The maximum gage height of 5.84 ft. occurred at 1630 on Feb. 3, 2010 as a result of backwater from ice on the control section.
Discharge.--	Shifts were applied as defined by measurements and were distributed by time and stage. To ensure a smooth transition from water year 2009, variable shift curve LAPMEX09VSB was continued in use until 1256 on Nov. 6, 2009. Shifts were distributed by time from 1300 Nov. 6, 2009 until 1026 Feb. 19, 2010 which is the first measurement (No. 1396) after the ice affected record. Shifts were then distributed by stage utilizing shift curve LAPMEX10VSA as defined by measurement Nos. 1396 - 1409, from 1100 Feb. 19, 2010 until 1353 Aug. 3, 2010 (peak flow during the monsoon season). Shift curve LAPMEX10VSB defined the lower flows (measurement Nos. 1409 - 1410) which occurred from 1400 Aug. 3, 2010 until 1459 Sept. 17, 2010. Shifts were distributed by time from 1500 Sept. 17, 2010 until the end of the water year. Open-water measurements showed shifts varying between -0.01 and +0.04 feet. Shifts were applied directly and given full weight except measurement Nos. 1392, 1398, 1399, 1400, 1403 and 1410 which were discounted from -1% to 8% to smooth shift distribution. Measurement No. 1397 was not used in the shift distribution. It is an outlier to the rating as well as the discharge measurements made before and after this measurement. The stable control and multiple measurements from previous water years define the rating at or near the high water measurement made this year. Measurement Nos. 1399 and 1400 (high flow measurement) were made during the same time period on the same day (but at a different cross-section and with different methods). Therefore the high flow measurement was adjusted to the rating within the error of the measurement. The shift for measurement Nos. 1394 and 1395 were not used because the measurements were made while the stage-discharge relationship was ice affected.
Special Computations.--	Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, air temperature data collected at the gage, and two measurements at the gage during ice effect. A hydrograph was used to compare the Stateline flows with the flows at the Long Hollow gage during ice affected periods.

Remarks.--

Record good, except for the period from Nov. 25-28; Dec. 2-31, 2009; Jan. 1-31; Feb. 1-10, 23, 24, 2010, in which ice affected the stage-discharge relationship. Record during this period is estimated and should be considered poor. Station maintained and record developed by Brian Boughton.

Recommendations.--

None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE--

LAPMEXCO33 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

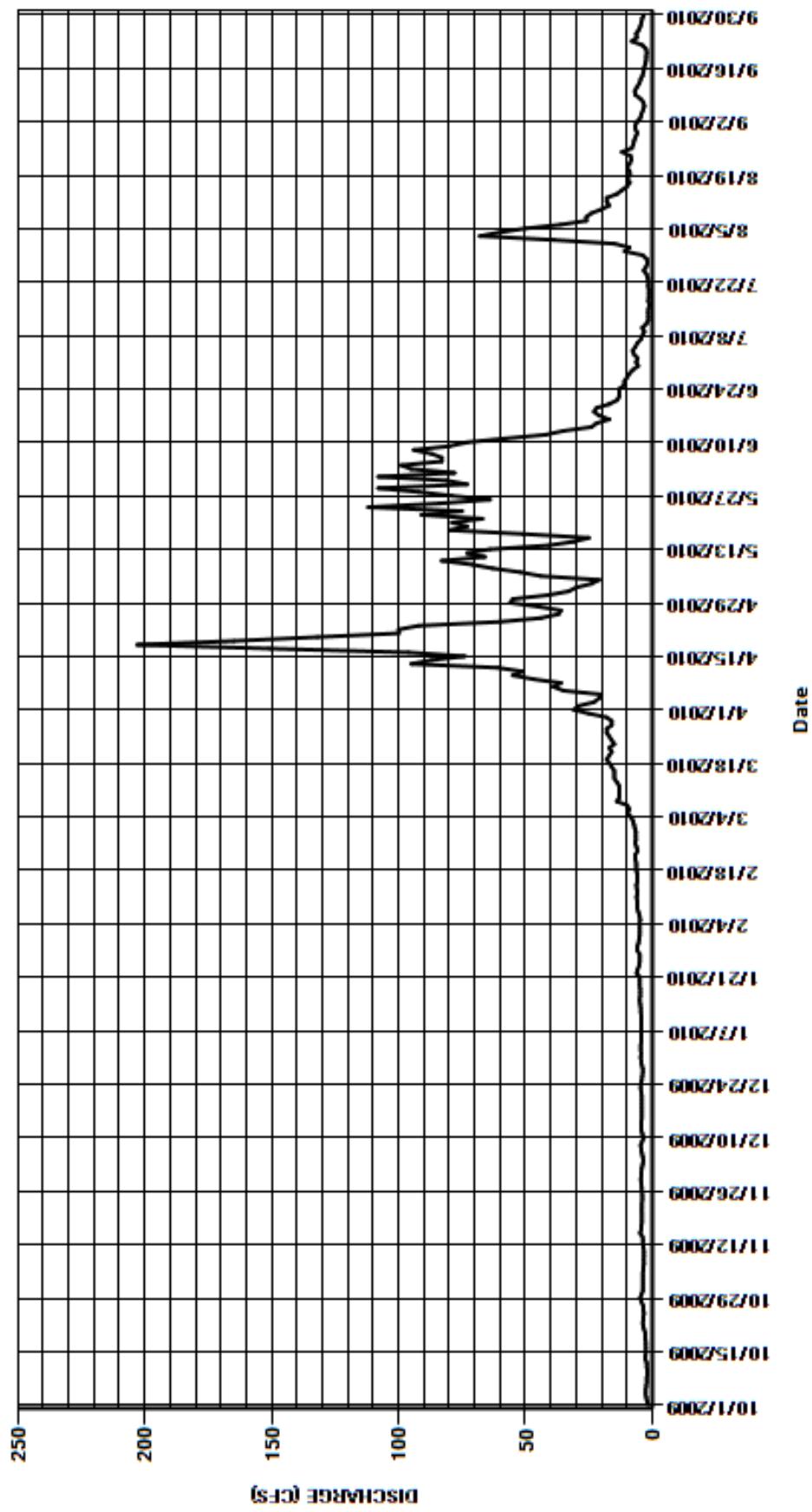
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	3.7	4.3	e4.4	e5	6.9	31	41	108	6.4	15	6.8
2	2.1	3.7	e4.2	e4.6	e5	7.3	29	33	78	5.8	39	5.9
3	2.4	3.7	e3.8	e4.6	e5	7.7	23	30	95	7.2	68	4.7
4	2.7	3.7	e3.6	e4.4	e5	8.6	21	24	99	7.8	60	4.3
5	2.6	3.7	e3.8	e4.4	e4.8	9.8	20	21	83	6.7	50	3.7
6	2.4	3.6	e4.2	e4.4	e5	9	35	44	83	5.9	36	3.2
7	2.2	3.3	e4.4	e4.4	e5.5	10	39	52	87	4.5	26	3.5
8	2.2	3.5	e4.6	e4.4	e6	14	36	63	94	3.9	26	4.8
9	2	3.3	e4	e4.4	e6	13	47	71	80	3.2	24	6.8
10	2	3.3	e3.4	e4.4	e6	13	55	83	73	4	20	6.9
11	2.2	3.5	e4	e4.4	6.2	13	51	66	58	2.4	17	6.1
12	2.2	3.7	e4.4	e4.6	5.9	13	61	73	42	1.6	18	5.1
13	2.8	3.7	e4.4	e4.6	6.1	14	95	64	35	1.6	18	4.7
14	2.7	3.9	e4.4	e4.8	6.3	15	87	41	24	1.7	14	3.9
15	2.5	4.8	e4.2	e5	5.9	15	74	31	22	1.5	12	3.5
16	2.5	4.4	e4.2	e4.8	5.9	15	96	25	17	1.2	10	3.3
17	2.6	4.3	e4.2	e4.8	6	16	151	51	21	1.6	8.9	2.8
18	2.7	4.1	e4.2	e4.8	6.3	17	203	80	23	1.4	9.9	2.5
19	2.7	4.1	e4.2	e5	6.4	18	165	73	22	1.4	8.8	2.4
20	2.9	4.1	e4.2	e5	6.4	17	132	79	17	1.4	9	2.2
21	3.4	4.2	e4.2	e5	6.8	16	100	67	14	1.7	10	2.5
22	3.7	4.1	e4.4	e6.2	6.8	17	100	91	13	1.6	8.9	4
23	3.7	4.1	e4.6	e5.8	e5.8	15	92	75	13	1.8	8.3	8.1
24	3.6	4	e4.6	e5.2	e6.2	16	60	112	13	2.3	8.6	6.1
25	3.3	e4	e4.2	e5	6.8	17	44	84	11	3.4	12	6.4
26	3.6	e4.2	e4	e5	6.5	18	37	64	11	2.4	8.1	5.3
27	3.7	e4.2	e3.8	e5	6.6	18	36	79	10	1.9	7.5	4.7
28	4.3	e4.4	e3.8	e6	6.5	16	45	92	9	2.2	7.2	4.3
29	4.8	4.5	e4.2	e6	---	16	56	108	7.7	3.9	6.6	4
30	4.2	4.4	e4.4	e5.4	---	18	55	73	5.6	11	5.9	3.3
31	3.7	---	e4.6	e5.2	---	25	---	81	---	9	6.7	---
TOTAL	90.1	118.2	129.5	152.0	166.7	444.3	2076	1971	1268.3	112.4	579.4	135.8
MEAN	2.91	3.94	4.18	4.9	5.95	14.3	69.2	63.6	42.3	3.63	18.7	4.53
AC-FT	179	234	257	301	331	881	4120	3910	2520	223	1150	269
MAX	4.8	4.8	4.6	6.2	6.8	25	203	112	108	11	68	8.1
MIN	1.7	3.3	3.4	4.4	4.8	6.9	20	21	5.6	1.2	5.9	2.2
CAL YR	2009	TOTAL	5583.99	MEAN	15.3	MAX	112	MIN	0.25	AC-FT	11080	
WTR YR	2010	TOTAL	7243.7	MEAN	19.8	MAX	203	MIN	1.2	AC-FT	14370	

MAX DISCH: 212 CFS AT 18:00 ON Apr. 18,2010 GH 4.95 FT. SHIFT 0 FT.

MAX GH: 5.84 FT. AT 16:30 ON Feb. 03,2010 (backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09366500 LAPLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE
WY2010 HYDROGRAPH



SAN JUAN RIVER BASIN
MANCOS RIVER NEAR MANCOS
Water Year 2010

Location.--	Lat. 37°21'13", Long. 108°15'41", in NE¼NE¼ sec. 27, T.36 N., R.13 W., NMMPM, Montezuma County.
Drainage and Period of Record.--	72.6 mi ² .
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a concrete block shelter and a 42 in concrete well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature gage was added to the station this year. No other changes.
Hydrologic Conditions.--	Large cobbles and boulders line the channel above and below the gage. Diversions for irrigation and filling reservoirs affect the flow at the gage.
Gage-Height Record.--	The primary record is hourly averages of 15-minute shaft encoder data downloaded from the DCP with chart record used for backup purposes. The gage was visited on 22 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted seven times throughout the year, ranging from 0.03 to -0.01 ft. Six flush corrections were made this water year. The flush corrections occurred in 2010 on April 20 (+0.07 ft.), May 10 (+0.05 ft.), May 10 (+0.05 ft, not applied), May 18 (+0.10 ft.), May 24 (+0.02 ft.) and June 9 (+0.04 ft.). The flush corrections were prorated by time within the final record depending on the location of the inflection point on the hydrograph. Shaft encoder corrections and initial flush correction readings were not always reliable during the summer 2010 due to sediment around the base of the oil cylinder. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice: Nov. 16, 17, 22-30, Dec. 1-5, 14, 15, 18-20, 23-28, 31, 2009 , Jan. 1, 15, 16, 18, 20-26, 31, Feb. 1-3, 5, 7-19, 22-27, March 1-2, 6, 12, 13, 15, 2010 .
Datum Corrections.--	Levels were not run this water year. However, levels were run on October 6, 2010. No adjustments to the datum were made.
Rating.--	The control is a rock riffle located directly below the gauge. The channel is the control at high flow. Gravel and sand fill and scour on the control section with the change in stage causing shifts. Rating No. 10, in use since October 28, 2008, was used for the entire water year. It is well defined from 0.99 cfs to 800 cfs (150% of the historical highest discharge measurement made in WY 2005). Sixteen measurements (Nos. 615 - 630) were made during the water year ranging in discharge from 2.37 cfs to 118 cfs. They cover the range in stage experienced except for the lower average daily flows of Nov. 28, Dec. 3-10, 14, 15, 18-31; 2009 and Jan. 1, 2010 and the higher average daily flows of Apr. 17, May 22, 23, 27-30; 2010. The peak instantaneous flow of 263 cfs occurred at 0230 on May 29, 2010 at a gage height of 4.64 ft. with a shift of 0.02 ft. It exceeded the stage of measurement No. 624, made May 24, 2010 by 0.35 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by gravel and sand filling and scouring on the control section. Shifts were distributed by time from the beginning of the water year until February 18, 2010, at which time variable shift curve MANMANCO10VSA was implemented until July 28, 2010. At this time shifts were distributed by time until the end of the water year. Measurements show shifts varying from 0.08 feet to -0.05 feet. Shifts were applied directly and given full weight except Measurement Nos. 616, and 619, 620, 621, 622 and 623, which were discounted from -11% to 5%. Measurement No. 617 and 618 were during periods of ice-affected stage.
Special Computations.--	Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and NOAA air temperature records (Mancos.5327.NOAA).
Remarks.--	Record good, except for those periods of ice affected records, which are poor and from the period April 7, 2010 to the end of the water year, which is fair record as a result of silt build up around the oil cylinder. This resulted in a lag effect on the shaft encoder and pen floats. This effects average gage height significantly over a short period, but daily average gage heights should be minimally affected. No adjustments were made to the record as a result of this silt build up. Station maintained by Div 7 staff and record developed by Jason Morrow.
Recommendations.--	A threshold should be installed to prevent mice and rodents from entering the shelter.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MANCOS RIVER NEAR MANCOS

RATING TABLE--

MANMANCO10 USED FROM 01-Oct-2009 TO 30-Sep-2010

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.3	4.7	e2.4	e2.1	e3.5	e3.9	22	35	94	25	65	9
2	5.3	4.3	e2.4	3.2	e3.5	e3.9	15	33	78	23	51	8.6
3	5.2	4.1	e2	3.1	e3.5	4.5	12	26	65	22	49	9.8
4	5	3.8	e1.8	3	3.5	5.4	15	24	68	21	42	12
5	5.5	3.7	e1.6	3	e3.5	5.8	29	36	77	21	37	12
6	5	3.6	1.6	3	3.6	e6	29	62	91	20	33	11
7	4.5	3.4	2	2.8	e3.7	6.3	24	63	97	18	30	10
8	4.4	2.8	1.9	2.7	e3.6	6.2	36	71	86	18	29	13
9	4	2.8	1.9	3.1	e3.6	6.2	47	68	75	18	28	15
10	3.6	2.6	2.1	3	e3.6	5.5	50	74	59	18	26	13
11	3.6	2.6	2.7	3	e3.6	5.1	52	45	38	16	25	12
12	3.4	2.9	2.8	3	e3.6	e5.5	63	34	28	16	26	11
13	5	3.4	2.6	3.3	e3.6	e6	50	33	21	16	23	9.5
14	5	4.6	e2	3.5	e3.6	6.9	39	31	13	18	20	8.6
15	4.3	3	e2	e3	e3.6	e7	48	26	15	19	19	7.3
16	4.4	e4	2.4	e3	e3.6	6.6	79	30	21	21	20	9.3
17	4	e4.4	2.4	2.8	e3.6	7.8	123	45	25	22	25	9.5
18	4.1	4.4	e2.2	e3	e3.6	9.5	104	58	28	22	20	9.2
19	4	4.4	e2.2	3	e3.6	11	83	36	27	23	21	9
20	4.1	3.7	e2.2	e3	3.7	9.4	81	46	24	28	26	9.7
21	4.6	3	2.2	e3	e3.8	9.7	89	111	25	33	24	10
22	4.6	e3	2.2	e3	e3.7	11	91	159	26	33	21	13
23	4.3	e2.8	e2.2	e3	e3.5	13	58	119	24	39	23	25
24	4	e2.8	e2.2	e3	e3.6	13	40	115	25	31	24	13
25	3.7	e3.2	e2	e3	e3.7	13	39	102	24	28	23	10
26	3.2	e3.2	e2	e3.3	e3.7	12	41	113	22	27	18	9.2
27	2.8	e3	e2	3.7	e3.8	10	60	139	22	30	15	8.6
28	3.8	e2.3	e2	3.4	3.9	11	81	187	25	33	14	9.3
29	2.5	e2.4	2.1	3.6	---	16	81	201	27	35	13	8.9
30	5.8	e2.4	2.1	3.5	---	23	50	146	25	33	14	8.4
31	5.6	---	e2.1	e3.5	---	27	---	105	---	38	12	---
TOTAL	135.6	101.3	66.3	95.6	101.4	287.2	1631	2373	1275	765	816	323.9
MEAN	4.37	3.38	2.14	3.08	3.62	9.26	54.4	76.5	42.5	24.7	26.3	10.8
AC-FT	269	201	132	190	201	570	3240	4710	2530	1520	1620	642
MAX	6.3	4.7	2.8	3.7	3.9	27	123	201	97	39	65	25
MIN	2.5	2.3	1.6	2.1	3.5	3.9	12	24	13	16	12	7.3

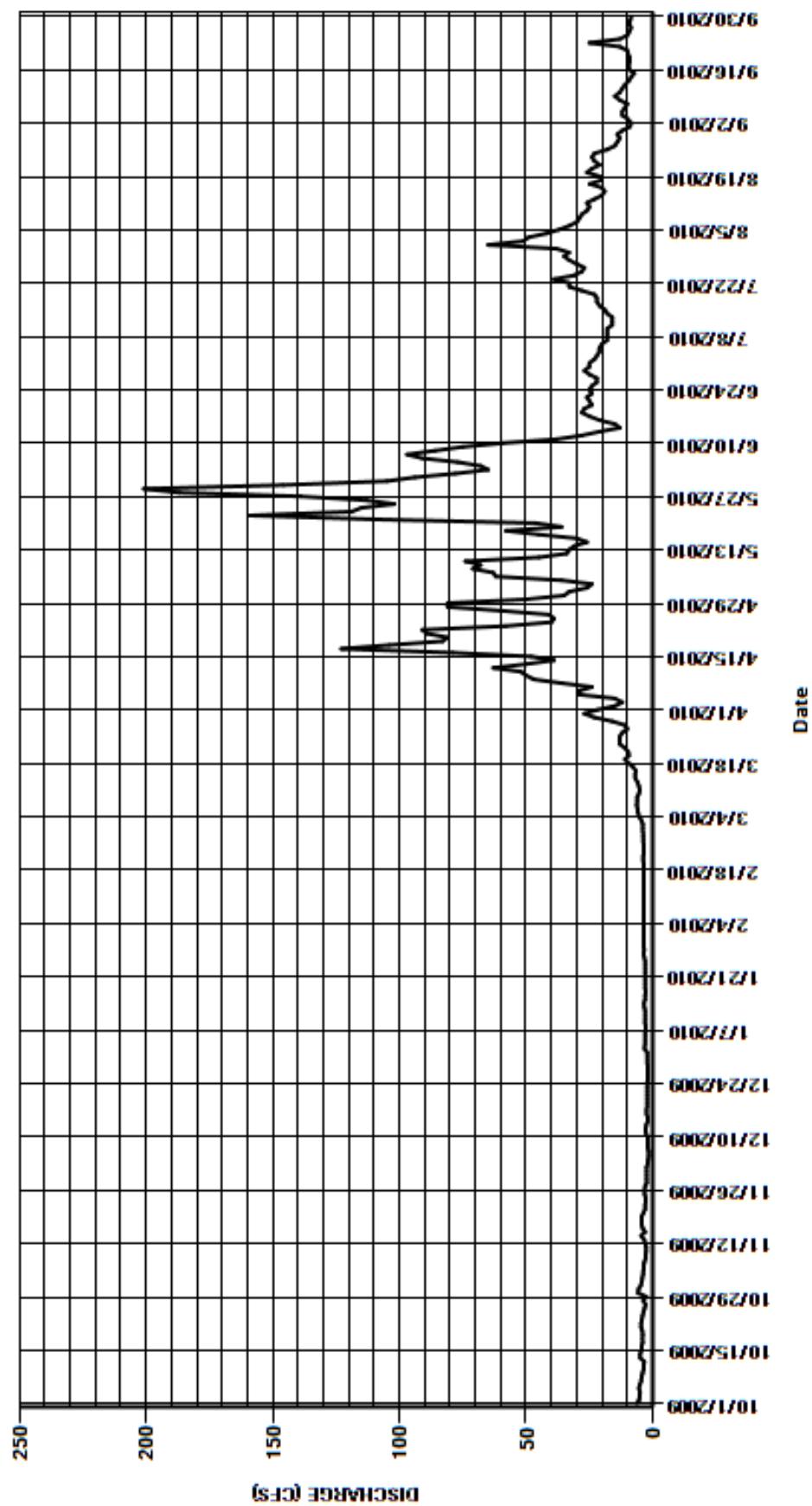
CAL YR	2009	TOTAL	7609.4	MEAN	20.8	MAX	201	MIN	1.6	AC-FT	15090
WTR YR	2010	TOTAL	7971.3	MEAN	21.8	MAX	201	MIN	1.6	AC-FT	15810

MAX DISCH: 263 CFS AT 02:30 ON May. 29,2010 GH 4.64 FT. SHIFT 0.02 FT.

MAX GH: 4.64 FT. AT 02:30 ON May. 29,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MANCOS RIVER NEAR MANCOS
WY2010 HYDROGRAPH



Station Identification Codes

DIV I

CODE	NAME
ADATUNCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL, NEAR ESTES PARK
ADANETCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL (NET), NEAR ESTES PARK
BCRMORCO	BEAR CREEK AT MORRISON
BCRSHECO	BEAR CREEK AT SHERIDAN
BERDITCO	BERTHOUD PASS DITCH AT BERTHOUD PASS
BFCLYOCO	BOULDER CREEK FEEDER CANAL NEAR LYONS
BIGLASCO	BIG THOMPSON AT MOUTH, NEAR LA SALLE
BOBGLNCO	BOB CREEK DITCH NEAR GLENDEVEY
BOCBGRCO	SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
BOCELSCO	SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
BOCMIDCO	MIDDLE BOULDER CREEK AT NEDERLAND
BOCOBODO	BOULDER CREEK AT BOULDER
BOCOROCO	BOULDER CREEK NEAR ORODELL
BORDITCO	BOREAS PASS DITCH AT BOREAS PASS
BOSDELCO	SOUTH BOULDER CREEK, DIVERSION NR ELDORADO SPRINGS
BTABESCO	BIG THOMPSON RIVER ABOVE LAKE ESTES
BTBLESCO	BIG THOMPSON RIVER BELOW LAKE ESTES
BTCANYCO	BIG THOMPSON RIVER AT MOUTH OF CANYON, NEAR DRAKE
BTPPMCCO	CHARLES HANSEN FEEDER CANAL POWER PLANT TO BIG THOMPSON
BUCRMVCO	BUCKHORN CREEK NEAR MASONVILLE
BTNFDRCO	NORTH FORK BIG THOMPSON RIVER AT DRAKE
CAPDCPCO	CAMERON PASS DITCH NEAR CAMERON PASS
CLAFTCCO	CACHE LA POUDRE AT CANYON MOUTH, NEAR FORT COLLINS
CLAGRECO	CACHE LA POUDRE NEAR GREELEY
CLAWASCO	CACHE LA POUDRE AT GREELEY WASTEWATER TREATMENT PLANT
CLEDERCO	CLEAR CREEK AT DERBY
COCREPCO	COAL CREEK NEAR PLAINVIEW
DEADDPCO	DEADMAN DITCH NEAR DEADMAN PARK
DILTUNCO	DILLE TUNNEL NEAR DRAKE
FALIDACO	FALL RIVER AT MOUTH NEAR IDAHO SPRINGS
FISHESCO	FISH CREEK NEAR ESTES PARK
GRNDRDCO	GRAND RIVER DITCH AT LA POUDRE PASS
GUMCLRCO	A.P. GUMLICK TUNNEL RELEASE TO CLEAR CREEK AT JONES PASS
HFCBBSCO	CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
HFCWASCO	CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
HOMSPICO	AURORA HOMESTAKE PIPELINE
HSPTUNCO	HOOSIER PASS TUNNEL AT MONTGOMERY RES., NEAR ALMA
LAPTUNCO	LARAMIE POUDRE TUNNEL
LEFTHDCO	LEFTHAND DIVERSION S. ST. VRAIN CREEK NEAR WARD
LTCANYCO	LITTLE THOMPSON RIVER AT CANYON MOUTH, NEAR BERTHOUD
MICDCPCO	MICHIGAN DITCH AT CAMERON PASS
MIDSTECO	MIDDLE ST. VRAIN CREEK NR. PEACEFUL VALLEY
MOFTUNCO	MOFFAT WATER TUNNEL, GILPIN COUNTY
OLYTUNCO	OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL) AT LAKE ESTES
ONEJURCO	SOUTH PLATTE RIVER AT JULESBURG CHANNEL #1
PIOHDGCO	PIONEER DITCH AT HEADGATE
PIOSTLCO	PIONEER DITCH AT CO/NE STATE LINE
PLAANTCO	SOUTH PLATTE RIVE BELOW ANTERO RESERVOIR
PLABALCO	SOUTH PLATTE RIVER AT COOPER BRIDGE, NEAR BALZAC
PLACHACO	SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
PLACHECO	SOUTH PLATTE RIVER BL. CHEESMAN RESERVOIR
PLADENCO	SOUTH PLATTE RIVER AT DENVER
PLAGEOCO	SOUTH PLATTE RIVER NEAR LAKE GEORGE
PLAGRACO	NORTH FORK SOUTH PLATTE RIVER AT GRANT
PLAHARCO	SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
PLAHENCO	SOUTH PLATTE RIVER AT HENDERSON
PLAJUCCO	SOUTH PLATTE RIVER AT JULESBURG COMBINED
PLAJULCO	SOUTH PLATTE RIVER AT JULESBURG LEFT CHAN. #4
PLAJURCO	SOUTH PLATTE RIVER AT JULESBURG RIGHT CHAN. #2
PLAKERCO	SOUTH PLATTE RIVER NEAR KERSEY
PLASPICO	SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
PLASPLCO	SOUTH PLATTE RIVER AT SOUTH PLATTE
PLASTRCO	SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
PLAWATCO	SOUTH PLATTE RIVER AT WATERTON
PLAWELCO	SOUTH PLATTE RIVER NEAR WELDONA
ROBTUNCO	ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
SKYDCLCO	SKYLINE DITCH AT CHAMBERS LAKE
SSVWARCO	SOUTH ST. VRAIN NEAR WARD
STCTUNCO	STRAIGHT CREEK TUNNEL AT EISENHOWER TUNNEL
STLINECO	STATELINE DITCH RETURN NEAR JULESBURG
SVCLYOCO	SAINT VRAIN CREEK AT LYONS
SVCPLACO	ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE

SVSLYOCO	ST. VRAIN SUPPLY CANAL NEAR LYONS
TARBORCO	TARRYALL CREEK AT BORDEN DITCH NEAR JEFFERSON
TARTARCO	TARRYALL CREEK BELOW TARRYALL RESERVOIR
VIDTUNCO	VIDLER TUNNEL NEAR ARGENTINE PASS
WINDESCO	WIND RIVER NEAR ESTES PARK
WINBYPCO	WIND RIVER BY-PASS NEAR ESTES PARK
WSDEARCO	WILSON SUPPLY DITCH NEAR EATON RESERVOIR

DIV II

CODE	NAME
ARKCACCO	ARKANSAS RIVER AND CATLIN CANAL COMBINED
ARKCANCO	ARKANSAS RIVER AT CANYON CITY
ARKCARCO	ARKANSAS RIVER BELOW X-Y DITCH DAM NEAR CARLTON
ARKCATCO	ARKANSAS RIVER BELOW CATLIN DAM NEAR FOWLER
ARKGRNCO	ARKANSAS RIVER AT GRANITE
ARKLAJCO	ARKANSAS RIVER AT LA JUNTA
ARKNEPCO	ARKANSAS RIVER NEAR NEPESTA
ARKNECCO	ARKANSAS RIVER AT NEPESTA ROAD BRIDGE COMBINED
ARKPORCO	ARKANSAS RIVER AT PORTLAND
ARKPUECO	ARKANSAS RIVER ABOVE PUEBLO
ARKROCCO	ARKANSAS RIVER AT ROCKY FORD
ARKSALCO	ARKANSAS RIVER AT SALIDA
ARKWELCO	ARKANSAS RIVER NEAR WELLSVILLE
BOUTUNCO	CHARLES H. BOUSTEAD TUNNEL
BUSTUNCO	BUSK-IVANHOE TUNNEL
CATCANCO	CATLIN CANAL AT CATLIN DAM, NEAR FOWLER
CANSWKCO	CROOKED ARROYO NEAR SWINK
CCACCRCO	CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
CCBCCRCO	CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
CHCRNACO	CHALK CREEK AT NATHROP
COLDITCO	COLUMBINE DITCH
COCRBVCO	COTTONWOOD CREEK NEAR BUENA VISTA
CRBRLVCO	CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
CRHBLVCO	CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA
EWIDITCO	EWING DITCH
GRAWESCO	GRAPE CREEK NEAR WESTCLIFFE
HILCANCO	HIGHLAND CANAL BELOW HIGHLAND DAM NEAR LAS ANIMAS
HOMTUNCO	HOMESTAKE TUNNEL
HRC194CO	HORSE CREEK AT HIGHWAY 194
HURREDCO	HUERFANO RIVER NEAR REDWING
LAKATLCO	LAKE CREEK ABOVE TWIN LAKES RESERVOIR
LAKBTLCO	LAKE CREEK BELOW TWIN LAKES RESERVOIR
LARDITCO	LARKSPUR DITCH AT MARSHALL PASS
LFCBSLCO	LAKE FORK CREEK BELOW SUGAR LOAF DAM NR. LEADVILLE
MUDTOOCO	MUDGY CREEK NEAR TOONERVILLE
NMCHIGCO	NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
OXFDITCO	OXFORD FARMERS DITCH NEAR NEPESTA
PURHILCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
PURHICCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS (COMBINED)
PURNICCO	PURGATOIRE R AT NINEMILE DAM, NR HIGBEE COMBINED
PURNINCO	PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE
PURTRICO	PURGATOIRE RIVER AT TRINIDAD
RACRSTCO	RATON CREEK ABOVE STARKVILLE
RULTOOCO	RULE CREEK NEAR TOONERVILLE
TWITUNCO	TWIN LAKES TUNNEL
WURDITCO	WURTZ DITCH NEAR TENNESSEE PASS
WUREXTCO	WURTZ EXTENSION DITCH NEAR TENNESSEE PASS

DIV III

CODE	NAME
ALABELCO	ALAMOSA CREEK BELOW TERRACE RESERVOIR
ALARANCO	ALAMOSA RIVER BELOW RANGER CREEK
ALATERCO	ALAMOSA CREEK ABOVE TERRACE RESERVOIR
ALAWIGCO	ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
BIGSPGCO	BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
CARLAGCO	CARNERO CREEK NEAR LA GARITA
CBPALACO	CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
CHECRECO	CHERRY CREEK NEAR CRESTONE
COCRMICO	COTTON CREEK NEAR MINERAL HOT SPRINGS
COCRESCO	COTTONWOOD CREEK NEAR CRESTONE
CONLASCO	COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

CONMOGCO	CONEJOS RIVER NEAR MOGOTE
CONPLACO	CONEJOS RIVER BELOW PLATORO RESERVOIR
CULSANCO	CULEBRA CREEK AT SAN LUIS
DEDCRECO	DEADMAN CREEK NEAR CRESTONE
DLFDT0CO	DON LA FONT DITCH, COMBINED, AT PIEDRA PASS
DLFDT1CO	DON LA FONT DITCH NO. 1 AT PIEDRA PASS
DLFDT2CO	DON LA FONT DITCH NO. 2 AT PIEDRA PASS
GARVILCO	GARNER CREEK NEAR VILLA GROVE
GOOWAGCO	GOOSE CREEK AT WAGONWHEEL GAP
KERVILCO	KERBER CREEK NEAR VILLA GROVE
LAGLAGCO	LA GARITA CREEK NEAR LA GARITA
LAJCAPCO	LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
LITSPGCO	LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA
LOSORTCO	LOS PINOS RIVER NEAR ORTIZ
MAJVILCO	MAJOR CREEK NEAR VILLA GROVE
NCLCONCO	NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
NOCRESKO	CRESTONE CREEK, NORTH NEAR CRESTONE
NORDLSCO	NORTON DRAIN NEAR LA SAUSES
NORDSCCO	SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
NORLASCO	NORTH CHANNEL CONEJOS RIVER NEAR LASAUSES
PINDELCO	PINOS CREEK NEAR DEL NORTE
PRWDITCO	PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
RIOALACO	RIO GRANDE RIVER AT ALAMOSA
RIODELCO	RIO GRANDE NEAR DEL NORTE
RIOLINCO	RIO GRANDE AT RIO GRANDE-ALAMOSA COUNTY LINE
RIOLOBCO	RIO GRANDE NEAR LOBATOS
RIOMILCO	RIO GRANDE AT THIRTY MILE BRIDGE
RIOMONCO	RIO GRANDE AT MONTE VISTA
RIOSFKCO	SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
RIOTRICO	RIO GRANDE RIVER ABOVE THE MOUTH OF TRINCHERA CREEK
RIOWAGCO	RIO GRANDE RIVER AT WAGONWHEEL GAP
RITCRECO	RITO ALTO CREEK NEAR CRESTONE
SAGSAGCO	SAGUACHE CREEK NEAR SAGUACHE
SANCRECO	SAN ISABEL CREEK NEAR CRESTONE
SANFTGCO	SANGRE DE CRISTO CREEK NEAR FT. GARLAND
SANMANCO	SAN ANTONIO RIVER NEAR MANASSA
SANORTCO	SAN ANTONIO RIVER AT ORTIZ
SOUCRECO	SOUTH CRESTONE CREEK NEAR CRESTONE
SOULASCO	SOUTH CHANNEL CONEJOS RIVER NEAR LASAUSES
SPACRECO	SPANISH CREEK NEAR CRESTONE
TABDITCO	TABOR DITCH AT SPRING CREEK PASS
TARBELCO	TARBELL DITCH NEAR COCHETOPA PASS
TREDITCO	TREASURE PASS DITCH AT WOLF CREEK PASS
TRIMTNCO	TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
TRISMICO	TRINCHERA CREEK BELOW SMITH RESERVOIR
TRITURCO	TRINCHERA CREEK AB. TURNER'S RANCH
UTEFTGCO	UTE CREEK NEAR FORT GARLAND
WCSDITCO	WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WEMDITCO	WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WFKMOUCO	WIGHTMAN FORK AT MOUTH AT ALAMOSA RIVER
WFKCROCO	WIGHTMAN FORK BELOW CROPSY CREEK NEAR SUMMITVILLE
WILCRECO	WILLOW CREEK NEAR CRESTONE

DIV IV

CODE	NAME
ABCLATCO	ABC LATERAL
GUNREDCO	GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
MUDAPRCO	MUDDY CREEK ABOVE PAONIA RESERVOIR
MUDBPRCO	MUDDY CREEK BELOW PAONIA RESERVOIR
RLCGRJCO	REDLANDS CANAL NR GRAND JUNCTION
SOUCANCO	SOUTH CANAL NR MONTROSE
UNCOLACO	UNCOMPAGRE RIVER NEAR OLATHE

DIV V

CODE	NAME
BLUNINCO	BLUE RIVER AT HIGHWAY 9 BRIDGE
CHAGULCO	CHAPMAN GULCH NEAR NAST
CRYDOWCO	CRYSTAL RIVER AT DOW FISH HATCHERY NEAR CARBONDALE
FRYIVLCO	FRYINGPAN RIVER NEAR IVANHOE LAKE
FRYMERCO	FRYINGPAN RIVER AT MEREDITH
FRYNFNCO	NORTH FORK FRYINGPAN RIVER NEAR NORRIE

FRYSFUCO	SOUTH FORK FRYINGPAN RIVER AT UPPER STATION
FRYTHOCO	FRYINGPAN RIVER NEAR THOMASVILLE
IVCRNACO	IVANHOE CREEK NEAR NAST
ROABMCCO	ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
ROAFRYCO	ROARING FORK RIVER ABOVE MOUTH OF FRYINGPAN RIVER NEAR BASALT
RFCMERCO	ROCKY FORK CREEK NEAR MEREDITH
SNAKEYCO	SNAKE RIVER AT KEYSTONE
WSDRAVCO	WEST DIVIDE CREEK NEAR RAVEN

DIV VI

CODE	NAME
ILLRANCO	ILLINOIS RIVER NEAR RAND
MICMERCO	MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
MICWLDCO	MICHIGAN RIVER NEAR WALDEN
MORBSCCO	MORRISON CREEK BELOW SILVER CREEK
PTCKSLCO	POT CREEK AT UTAH-COLORADO STATELINE NEAR VERNAL
WILBSLCO	WILLOW CREEK BELOW STEAMBOAT LAKE
WLTNCKCO	WALTON CREEK NEAR STEAMBOAT SPRINGS
WMFKHMCO	WILLIAMS FORK AT MOUTH NEAR HAMILTON
YAMABVCO	YAMPA RIVER ABOVE LAKE CATAMOUNT

DIV VII

CODE	NAME
ANIHOWCO	ANIMAS RIVER NEAR HOWARDSVILLE
BLADIVCO	BLANCO DIVERSION NEAR PAGOSA SPRINGS
CHEREDCO	CHERRY CREEK AT THE MOUTH NEAR RED MESA
DOLBMCCO	DOLORES RIVER BELOW MCPHEE RESERVOIR
DOLTUNCO	DOLORES TUNNEL OUTLET NEAR DOLORES
ENTDITCO	ENTERPRISE DITCH AT THE COLO-NEW MEXICO STATELINE
FLOALECO	FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
FLOBLECO	FLORIDA RIVER BELOW LEMON RESERVOIR
LAPHESCO	LA PLATA RIVER AT HESPERUS
LAPMEXCO	LA PLATA RIVER AT THE COLORADO/NEW MEXICO LINE
LITOSOCO	LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM NEAR CHROMO
LONREDCO	LONG HOLLOW AT THE MOUTH NEAR RED MESA
LOSODVCO	LITTLE OSO DIVERSION NEAR CHROMO
LPCDITCO	LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
MANMANCO	MANCOS RIVER NEAR MANCOS
MVIDIVCO	LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
NAVBARCO	NAVAJO RIVER AT BANDED PEAKS RANCH NEAR CHROMO
NAVOSOCO	NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
OSODIVDO	OSO DIVERSION NEAR CHROMO
PINDITCO	PINE RIDGE DITCH NEAR HESPERUS
PIODITCO	PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
RIOBLACO	RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
RIOMOUCO	RIO BLANCO AT THE MOUTH NEAR TRUJILLO